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NEW NAMES AND COMBINATIONS, PRINCIPALLY IN THE ROCKY MOUNTAIN
FLORA--IV

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The third paper in this series was published in *Phytologia* 53:187-190. 1983.

A NEW GENUS OF GRASSES FROM THE WESTERN OIL SHALES

ARGILLOCHLOA W. A. Weber, **gen. nov.** (Poaceae)

Gramen perenne, inflorescentis non secundis, ramis floriferis rigidissimo-divaricatis basalibus 2, spiculis 2-floribus, gluma secundo lemma secundum aequans, lemmatibus sterilibus nullis vel rudimento clavato sterili faciens, a *Festuca* differt.

Type species: *Argillochloa dasyclada* (Hackel ex Beal) W. A. Weber, **comb. nov.** *Festuca dasyclada* Hack. ex Beal, *Grasses N. Amer.* 2:602. 1875. Derivation from Greek, *argillos*, clay (including shale), + *chloe*, grass.

Festuca dasyclada, until very recently, was known from the type locality (Wasatch Plateau, Emery County, Utah), but field knowledge was nil. Irvine *et al.* (1978), reporting it from Colorado, wrote: "This plant was listed as "possibly extinct" in the "Report on Endangered and Threatened Species of the United States"... Only two vouchers of this taxon exist in major herbaria (US, NY), and mention of the species last occurs in the second edition of Hitchcock's treatment of the grasses...."

This species was reported from Colorado (Irvine, *l.c.*) from the Upper Parachute Member of the Green River Formation and the Uinta Sandstone throughout Garfield County, Colorado. Recent activity involving environmental impact research has added a number of localities in Rio Blanco County at altitudes from 2,135-2,580 meters (7,120-9,000 ft.). *Argillochloa* often occurs abundantly on shaded slopes in mountain shrub communities (e.g. *Padus virginiana*, *Juniperus osteosperma*, *Amelanchier utahensis*, *Symphoricarpos oreophilus* stands), here to the exclusion of *Oryzopsis*.

The plant is a bunch-grass with a very strong but superficial resemblance to *Oryzopsis hymenoides*, and occurring near it on the same areas of shale scree slopes. The two grasses seem to have slightly different ecological preferences, however, because stands of *Argillochloa* are never as ubiquitous as those of *Oryzopsis*, which commonly colonizes mixed soils of eroding road banks as well as the pure shale slopes.

Argillochloa differs strikingly from *Festuca* by its rigidly divaricate secondary branches, at the bases of which a strongly-developed convex, often red, pulvinus fills the axils; the spike-

lets have an unusually long second glume which equals the second lemma; the spikelets have two fertile florets; the terminal rachilla is either naked or sometimes topped by an early-deciduous sterile rudiment; the lowermost branchlets of the inflorescence are paired; the inflorescence is not at all second as in Festuca; at maturity the flowering culms commonly break away and behave like tumbleweeds. The habit is extremely unusual for Festuca, at least as it is known in America.

Signe Frederiksen (Univ. of Copenhagen, corresp.) has kindly made a thorough anatomical analysis of Argillochloa and found that, as she expected, "the anatomy is within the variation of the genus Festuca, but the question is how important that observation is." She continues: "According to Metcalfe (1960: Anatomy of Monocotyledons I. Anatomical evidences concerning genera and species: '.... there is a marked overlap in the characters of those genera that are generally accepted as being closely related to one another. This seems to indicate that differences between closely related genera, based on leaf characters alone, would be of little taxonomic value.' I would like to turn it around and say that if the morphological characters are strong enough to separate this taxon from Festuca, then resemblance in the anatomy of the leaf blade is of minor significance." Frederiksen was impressed by the morphological divergence of Argillochloa from Festuca noted herein.

I am greatly indebted to Dr. Dieter Wilken, Colorado State University, who has determined the chromosome number, $2n=28$ (14 bivalents at metaphase). This is consistent with the basic number of Festuca and allies ($x=7$) and represents a modal number for many western North American species. Voucher specimen: Wilken 13567 (CS), Rio Blanco Co.: Piceance Creek, 2 mi W of Rio Blanco, 22 Sept. 1979.

NEW COMBINATIONS IN LINUM, SENS. LAT.

ADENOLINUM GRANDIFLORUM (Desf.) W. A. Weber, **comb. nov.**
Linum grandiflorum Desf., Flora Atlantica 1:278. t. 78. 1798.

ADENOLINUM PRATENSE (Norton) W. A. Weber, **comb. nov.** Linum lewisii pratense J. B. S. Norton, Trans. Acad. Sci. St. Louis 12:38, pl. 6. 1902. Rogers (1968), in a review of the yellow-flowered species of Linum in western North America, did not concern himself with the generic problem in the genus Linum, **sens. lat.** Linum is based on the type, Linum usitatissimum L., a blue-flowered annual species with linear stigmas and erect flowers and basic chromosome number, $x=15$. In western North America, the blue-flowered group, Adenolinum Reichenbach (1837), has capitate stigmas and recurved fruiting pedicels, and basic chromosome number $x=9$. The pale yellow-flowered group consists of two well-defined line, both with $x=8$, though otherwise cytologically distinct according to Löve (corresp.): one, Cathartolinum Rchb. (1837), based on Linum catharticum L., with white petals with

yellow claws. The other is Rogers' L. schiedeanum complex, which Small (1907) included in his broadly construed Cathartolinum, differing significantly in fruit dehiscence, ovule number, pollen morphology, style morphology, and basic chromosome number $x=8$, from Mesynium Raf. (1838) (Rogers' L. rigidum group) with a basic chromosome number of $x=15$. Rogers clearly tabulated these important differences but declined to divide the genera. Löve & Löve recently revived Adenolinum and Mesynium (Löve 1982), quite justifiably in my opinion. With Adenolinum, Cathartolinum s. str., and Mesynium segregated, the L. schiedeanum complex forms a distinct group, but it needs more study before assigning it generic status.

MESYNIUM Raf., Fl. Telluriana 3:33. Nov.-Dec. 1837. A lectotype should be designated. Of the five species mentioned, M. texanum was new, three others were nom. nuda, and M. mexicanum (H.B.K.) Raf., was a transfer. I propose M. mexicanum be chosen as the lectotype.

MESYNIUM ALATUM (Small) W. A. Weber, **comb. nov.** Cathartolinum alatum Small, N. Am. Fl. 25:81. 1907.

MESYNIUM ARISTATUM (Engelm. in Wislitz.) W. A. Weber, **comb. nov.** Linum aristatum Engelm. in Wislitz., Tour Northern Mexico 101. 1848.

MESYNIUM AUSTRALE (Heller) W. A. Weber, **comb. nov.** Linum australe Heller, Bull. Torr. Bot. Club 25:627. 1898.

MESYNIUM AUSTRALE ssp. GLANDULOSUM (C. M. Rogers) W. A. Weber, **comb. nov.** Linum australe var. glandulosum Rogers, Sida 1:336. 1964.

MESYNIUM IMBRICATUM (Raf.) W. A. Weber, **comb. nov.** Nezera imbricata Raf., New Flora & Bot. North Amer. 4:66. 1838.

MESYNIUM HUDSONIOIDES (Planch.) W. A. Weber, **comb. nov.** Linum hudsonioides Planch., Lond. J. Bot. 7:186. 1848.

MESYNIUM PUBERULUM (Engelm. in A. Gray) W. A. Weber, **comb. nov.** Linum rigidum var. puberulum Engelm. in A. Gray, Smithson. Contr. Knowl. 3 (Pl. Wright. 1): 25. 1852.

MESYNIUM SUBTERES (Trel. in A. Gray) W. A. Weber, **comb. nov.** Linum aristatum Engelm. var. subteres Trel. in A. Gray, Syn. Fl. N. Am. 1(1):347. 1897.

MESYNIUM VERNALE (Wooton) W. A. Weber, **comb. nov.** Linum vernale Wooton, Bull. Torr. Bot. Club 25:452. 1898.

ALETES (APIACEAE): AN EXPANDED CONCEPT

Despite the fact that many eminent American botanists have attempted to classify the western North American Apiaceae, several genera remain to some extent artificial. While one complete treatment (Mathias and Constance, 1944-45) has tended to stabilize and reduce a number of generic names, the submergence of some of the old genera has simply served to hide the fact that large ones like Lomatium and Cymopterus are still very heterogeneous, and unless monographers of some of the allied genera carefully reexamine these large ones for misfits, this situation will likely continue.

The history of classification of the western North American umbels also displays a lack of consideration of the whole organism, its total morphology and habitus, its chemistry, phytogeography and its ecology--the whole constellation of characters. Too much emphasis, I feel, has been placed on too few.

The genus Aletes is based on Aletes acaulis C. & R., 1888 (Deweya acaulis Torr.). A revision of this genus was published very recently (Theobald, Tseng and Mathias, 1963). It was undertaken as a result of my rediscovery of Neoparrya lithophila and my suggestion, which they accepted, that Pteryxia anisata should be referred to Aletes. I have never been satisfied with the maintenance of Neoparrya as a monotypic genus, and recently (Weber 1979) I transferred a second taxon, N. megarrhiza, out of Lomatium, where it was anomalous.

Theobald et al., while they described a few new taxa, did not examine other genera for possible transfers to Aletes. They also deferred study of Pteryxia and implied that they were about to study Cymopterus. They pointed out, however, Cronquist's (1961) expansion of Cymopterus to include two more somewhat discordant elements, Pteryxia and Pseudocymopterus.

Theobald et al. described Aletes as "perennials from slender to thickened elongated roots". This is inaccurate. The structures they refer to are caudices that are covered with marcescent sheathing petiole bases, a critical difference. I would expand their generic concept to include plants with yellow, pale yellow to whitish and exceptionally (as in Pseudocymopterus) purple, flowers. And I would allow for considerable variation in the number, size and disposition of the vittae, and in the compression and development of the lateral and dorsal wings of the mericarps. I agree completely when they say that "the genus is remarkably consistent in its habit and basic leaf pattern". Their monograph is a good starting point, but more bricks need to be laid in order to make the building complete.

Without seriously altering the circumscription provided by Theobald et al., I regard Aletes as a natural group embodying the following unique constellation of characters:

1. Plants densely caespitose with stout, branched caudices clothed with long-enduring marcescent petiole-bases.
2. Strictly acaulescent (this eliminates Pteryxia terebinthina and C. beckii Welsh & Goodrich, which are always slightly caulescent); these may yet prove to belong to Aletes.
3. Pseudoscapae never developed.
4. Plants strongly scented (anise, citronella, celery).
5. Leaves pinnatifid or pinnate, with pinnae simple or pinnatifid, usually stiff-textured.
6. Bracteoles always well-developed, lance-linear to linear, dimidiate.
7. Involucre never developed.

8. Flowers yellow, pale yellow, whitish, or exceptionally purple.
9. Rays subequal, widely spreading, sometimes the outer ones deflexed at maturity.
10. Mericarps with variable development of lateral wings; dorsal ridges often prominent.
12. Mericarps usually trapezoidal in cross-section, not or variably dorsally compressed.
13. Stylopodium none, the styles arising out of the base of a spongy disk (some authors seem to have confused this disk with a low stylopodium).

If, bearing in mind this set of characters, one returns to the standard treatment of North American umbels, several taxa stand out in Lomatium, Pteryxia and Cymopterus as discordant elements. Furthermore, these taxa have always been controversial, placed variously in other discarded genera such as Cynomarathrum, Pseudoreoxis and Pseudopteryxia.

The following new combinations are proposed to bring these taxa into Aletes.

ALETES BIPINNATA (S. Wats.) W. A. Weber, **comb. nov.** Pseudocymopterus bipinnatus C. & R., Rev. N. Am. Umbell. 75. 1888.

ALETES EASTWOODIAE (C. & R.) W. A. Weber, **comb. nov.** Cynomarathrum eastwoodiae C. & R., Contr. U. S. Nat. Herb. 7:247. 1900.

ALETES HENDERSONII (C. & R.) W. A. Weber, **comb. nov.** Pseudocymopterus hendersonii C. & R., Contr. U. S. Nat. Herb. 7:190. 1900.

ALETES JUNCEA (Barneby & Holmgren) W. A. Weber, **comb. nov.** Lomatium junceum Barneby & Holmgren, Brittonia 31:96. 1979. Barneby & Holmgren (1979), in recognizing and presenting a key to the "Cynomarathrum species of Lomatium" saw the natural group that I feel is incorrectly placed in Lomatium, but they made no connection with Aletes. They, however, included L. triternatum and L. concinnum, two caulescent species, in the group.

ALETES LATILOBA (Rydb.) W. A. Weber, **comb. nov.** Cynomarathrum latilobum Rydb., Bull. Torr. Bot. Club 40:73. 1913.

ALETES LITHOPHILA (Mathias) W. A. Weber, **comb. nov.** Neoparrya lithophila Mathias, Ann. Mo. Bot. Gard. 16:393. 1929.

ALETES LONGILOBA (Rydb.) W. A. Weber, **comb. nov.** Pseudopteryxia longiloba Rydb., Bull. Torr. Bot. Club 40:72. 1913. Mathias, Theobald & Tseng (1964) did not include this taxon in their monograph of Aletes (despite the fact that Rydberg clearly showed its close relationship to P. anisata), probably because Mathias had earlier synonymized it (incorrectly, I feel) under Pteryxia hendersonii. Mathias et al. (1964) declined to discuss Pteryxia. A. longiloba differs from A. anisata chiefly in its more delicate leaf texture and more slender and attenuate leaf segments, but displays the same strong anise scent.

ALETES MEGARRHIZA (A. Nels.) W. A. Weber, **comb. nov.** Peucedanum megarrhizum A. Nels., Bull. Torr. Bot. Club 26:130. 1899.

ALETES MINIMA (Mathias) W. A. Weber, **comb. nov.** Lomatium minimum Mathias, Ann. Mo. Bot. Gard. 25:273. 1937.

ALETES NIVALIS (S. Wats.) W. A. Weber, **comb. nov.** Cymopterus nivalis S. Wats., Bot. King's Exp. 123. 1871.

ALETES NUTTALLII (A. Gray) W. A. Weber, **comb. nov.** Seseli nuttallii A. Gray, Proc. Amer. Acad. 8:287, in part. 1870.

ALETES PARRYI (S. Wats.) W. A. Weber, **comb. nov.** Peucedanum parryi S. Wats., Proc. Amer. Acad. 11:143. 1876.

ALETES PETRAEA (M. E. Jones) W. A. Weber, **comb. nov.** Cymopterus petraeus M. E. Jones, Contr. W. Bot. 8:32. 1898.

ALETES SCABRA (C. & R.) W. A. Weber, **comb. nov.** Cynomarathrum scabrum C. & R., Contr. U. S. Nat. Herb. 7:247. 1900.

ASKELLIA, A NEW SEGREGATE OF THE GENUS CREPIS

ASKELLIA W. A. Weber, **genus nov.** (Asteraceae).

Based on Crepis, Sect. Ixeridopsis Babcock, Univ. Calif. Publ. Bot. 22:212. 1947. Typus: Crepis nana Richardson. This genus, differing morphologically and cytologically from Crepis and Psilochenia (Crepis, sens. lat., cf. Babcock 1938, see Weber 1983), represents an Old World group with a basic chromosome number of $x=7$. It is named in honor of my friend Áskell Löve, student of Arne Muntzing and Eric Hultén, dean of the Icelandic flora, founder and first president of the International Organization of Plant Biosystematists. His dedication to the Science of Botany, his encyclopedic memory of botanical information, his understanding of biosystematic, especially cytological, techniques and his exposition of its philosophy, his role in developing the concept of the Flora Europaea and, in its earliest phase, what became the Flora North America Project, has earned him lasting recognition as one of the outstanding plant taxonomists of our generation. His kindness and support of colleagues and young botanists is well-known and appreciated by all who have benefitted from knowing him.

ASKELLIA ALAICA (Krasch.) W. A. Weber, **comb. nov.** Crepis alaica Krasch., Tr. Bot. Inst. AN SSSR, ser. 1,1:182. 1933.

ASKELLIA CORNICULATA (Regel & Schmalh.) W. A. Weber, **comb. nov.** Crepis corniculata Regel & Schmalh., Izv. Obsc. Ljubit. Estestv. Antrop. Etnogr. 34(2):54. 182.

ASKELLIA ELEGANS (Hook.) W. A. Weber, **comb. nov.** Crepis elegans Hook., Fl. Bor.-Amer. 1:297. 1834.

ASKELLIA FLEXUOSA (Ledeb.) W. A. Weber, **comb. nov.** Prenanthes polymorpha gamma flexuosa Ledeb., Fl. Altaica 4:145. 1833.

ASKELLIA KARELINII (M. Pop. & Schischk. in Popov) W. A. Weber, **comb. nov.** Crepis karelinii M. Pop. & Schischk. in Popov, Fl. Almat. zapovedn., Addenda 28:757. 1940.

ASKELLIA LACTEA (Lipsch.) W. A. Weber, **comb. nov.** Crepis lactea Lipsch., Fedde's Repert. 42:159. 1937.

ASKELLIA NANA (Richards.) W. A. Weber, **comb. nov.** Crepis nana Richards., Bot. App. Franklin, 1st Jour. ed. 1:746. (p.18 in repr.) 1823; ed. 2:757 (p.29 in repr.). 1823.

ASKELLIA NANA ssp. RAMOSA (Babcock) W. A. Weber, **comb. nov.** Crepis nana ssp. ramosa Babcock, Univ. Calif. Publ. Bot. 22:542. fig. 155. 1947.

ASKELLIA SOGDIANA (Krasch.) W. A. Weber, **comb. nov.** Youngia sogdiana Krasch., Bot. Mat. Herb. Bot. Inst. AN SSSR 9(4-12):184. 1946.

THE WESTERN NORTH AMERICAN WOODY SAGEBRUSHES

The western North American woody sagebrushes centering about Artemisia tridentata belong to a homogeneous group of similar morphology and ecology, differing from all other local Artemisia in having homogamous heads. One additional species was described from southern South America. Related species in Eurasia were segregated from Artemisia by Polyakov (1961) based on the type species Seriphidium maritimum (L.) Pol. Artemisia, Section Seriphidium had been proposed for this group by Besser (1829) and accepted by Hooker (1833) for Artemisia cana Pursh. Rouy (1903) treated it as Artemisia, Subgenus Seriphidium. The American species were treated by DeCandolle (1837) as Artemisia, Sect. Seriphidium, subsect. Trifida. This group has been treated exhaustively by Ward (1953). Earlier accounts include those of Rydberg (1916) and Hall & Clements (1923).

The North American members of the genus Seriphidium form a very natural unit and I propose recognizing them as a subgenus under the genus Seriphidium Polyakov.

SERIPHIDIUM, Subgenus TRIDENTATA (McArthur) W. A. Weber, **subgenus nov.** Based on Artemisia, Subgenus Tridentata ["Tridentatae"] McArthur (1981); Artemisia, subsect. Trifida DC., Prodr. 6:105. 1837. Typus: Seriphidium canum (Pursh) W. A. Weber. In this subgenus I include Rydberg's Subgenus Seriphidium of Artemisia, encompassing his Sections Tridentatae, Rigidae and Pygmaeae. McArthur (1981) included only Section Tridentatae Rydb.

SERIPHIDIUM ARBUSCULUM (Nutt.) W. A. Weber, **comb. nov.** Artemisia arbuscula Nutt., Trans. Amer. Phil. Soc. II. 7:398. 1841.

SERIPHIDIUM ARBUSCULUM ssp. LONGILOBUM (Osterh.) W. A. Weber, **comb. nov.** Artemisia spiciformis var. longiloba Osterh., Muhlenbergia 4:69. 1908.

SERIPHIDIUM CANUM (Pursh) W. A. Weber, **comb. nov.** Artemisia cana Pursh, Fl. Amer. Sept. 521. 1814.

SERIPHIDIUM CANUM ssp. BOLANDERI (A. Gray) W. A. Weber, **comb. nov.** Artemisia bolanderi A. Gray, Proc. Amer. Acad. 19:50. 1883.

SERIPHIDIUM CANUM ssp. **VISCIDULUM** (Osterh.) W. A. Weber, **comb. nov.** Artemisia cana var. viscidula Osterh., Bull. Torr. Bot. Club 26:507. 1900.

SERIPHIDIUM PYGMAEUM (A. Gray) W. A. Weber, **comb. nov.** Artemisia pygmaea A. Gray. Proc. Amer. Acad. 21:413. 1886.

SERIPHIDIUM NOVUM (A. Nels.) W. A. Weber, **comb. nov.** Artemisia nova A. Nels., Bull. Torr. Bot. Club 27:274. 1900.

SERIPHIDIUM RIGIDUM (Nutt.) W. A. Weber, **comb. nov.** Artemisia trifida beta rigida Nutt., Trans. Amer. Phil. Soc. II. 7:398. 1841.

SERIPHIDIUM ROTHROCKII (A. Gray) W. A. Weber, **comb. nov.** Artemisia tridentata ssp. rothrockii Hall & Clements, Carnegie Inst. Wash. Publ. 326:139. 1923.

SERIPHIDIUM TRIDENTATUM (Nutt.) W. A. Weber, **comb. nov.** Artemisia tridentata Nutt., Trans. Amer. Phil. Soc. II. 7:398. 1841.

SERIPHIDIUM TRIDENTATUM ssp. **PARISHII** (A. Gray) W. A. Weber, **comb. nov.** Artemisia parishii A. Gray, Proc. Amer. Acad. 17:220. 1882.

SERIPHIDIUM TRIDENTATUM ssp. **VASEYANUM** (Rydb.) W. A. Weber, **comb. nov.** Artemisia vaseyana Rydb., N. Amer. Flora 34:283. 1916.

SERIPHIDIUM TRIDENTATUM ssp. **WYOMINGENSE** (Beetle & Young) W. A. Weber, **comb. nov.** Artemisia tridentata ssp. wyomingensis Beetle & Young, Rhodora 67:405. 1965.

SERIPHIDIUM TRIPARTITUM (Rydb.) W. A. Weber, **comb. nov.** Artemisia tripartita Rydb., Mem. N. Y. Bot. Gard. 1:432. 1900. trifida Nutt., 1841, non Turcz. 1832.

Artemisia bigelovii A. Gray bears a strong superficial resemblance to Seriphidium, Subg. Tridentata, but Hall & Clements, and Ward, considered it to belong to Artemisia, Sect. Abrotanum. Shultz (1983, ined.) brings further evidence to bear toward this conclusion.

Artemisia mendozana DC., Prodrum 6:105. 1837, was included in the Subsect. Trifida by DeCandolle and presumably belongs in Seriphidium, but not having seen any material I hesitate to transfer it at this time.

Artemisia palmeri A. Gray, included by Ward, and Hall & Clements under Sect. Seriphidium remains anomalous, differing by its chaffy receptacle, elongate herbaceous branches, bicolored, deeply incised leaf-blades suggestive of A. vulgaris, and nearly equal phyllaries. I lean toward retaining Artemisiastrum Rydberg for this monotype.

MISCELLANY

ACROLASIA THOMPSONII (Glad) W. A. Weber, **comb. nov.** Mentzelia thompsonii Glad, Madrono 23:289. 1976.

BROMELICA BULBOSA (Geyer ex Porter & Coulter) W. A. Weber, **comb. nov.** Melica bulbosa Geyer ex Porter & Coulter, Syn. Fl.

Colo. p. 149. 1874. The articulation of the spikelets above the glumes, the lack of tendency of the spikelets to nod, and the world distribution patterns of Melica typified by M. nutans L. according to Tzvelev (1976) and Bromelica (Boyle, 1945), suggest that these groups represent different phyletic lines.

BROMELICA SPECTABILIS (Scribn.) W. A. Weber, **comb. nov.**
Melica spectabilis Scribn., Proc. Acad. Nat. Sci. Phila. 37:45. 1885.

DELPHINIUM RAMOSUM Rydb. var. **ALPESTRE** (Rydb.) W. A. Weber, **comb. nov.** Delphinium alpestre Rydb., Bull. Torr. Bot. Club 29:146. 1902.

IPOMOPSIS STENOTHYRSA (A. Gray) W. A. Weber, **comb. nov.**
Gilia stenothyrsa A. Gray, Proc. Amer. Acad. 8:276. 1870.

NUTTALLIA ARGILLOSA (Darlington) W. A. Weber, **comb. nov.**
Mentzelia argillosa Darlington, Ann. Mo. Bot. Gard. 21:153. 1934.

NUTTALLIA REVERCHONII (Urb. & Gilg) W. A. Weber, **comb. nov.**
Mentzelia pumila (Nutt.) T. & G. var. reverchonii Urb. & Gilg, Nov. Act. Nat. Cur. [Abh. K. Leop.-Carol. Deutsch. Akad. Naturf.] 76:94. 1900. Mentzelia reverchonii Thompson & Zavortink, Wrightia 4:24. 1968.

OLIGOSPORUS CAMPESTRIS (L.) Cass. ssp. **CAUDATUS** (Michx.) W. A. Weber, **comb. nov.** Artemisia caudata Michx., Fl. Bor. Amer. 2:129. 1803. The genus Oligosporus was proposed by Cassini for those groups of Artemisia with staminate disk flowers (Section Dracunculus of Hall & Clements, 1923).

OLIGOSPORUS CAMPESTRIS (L.) Cass. ssp. **PACIFICUS** (Nutt.) W. A. Weber, **comb. nov.** Artemisia pacifica Nutt., Trans. Amer. Phil. Soc. II. 7:401. 1841.

OLIGOSPORUS FILIFOLIUS (Torr.) W. A. Weber, **comb. nov.**
Artemisia filifolia Torr., Ann. Lyc. N. Y. 2:211. 1828.

OLIGOSPORUS PEDATIFIDUS (Nutt.) W. A. Weber, **comb. nov.**
Artemisia pedatifida Nutt., Trans. Amer. Phil. Soc. 11. 7:399. 1841.

PACKERA OODES (Rydb.) W. A. Weber, **comb. nov.** Senecio oodes Rydb., Bull. Torr. Bot. Club 33:158. 1906.

VITICELLA ORIENTALIS (L.) W. A. Weber, **comb. nov.** Clematis orientalis L., Sp. Pl. 543. 1753.

CORRECTIONS

In a previous paper (Weber & Löve 1981), inadvertent errors were made concerning the following new combinations and their basionyms. I am indebted to Dr. T. M. Barkley for drawing them to my attention.

Packera cana f. eradiata (D. C. Eaton) Weber & Löve, **comb. nov.** Senecio canus var. eradiatus D. C. Eaton in S. Wats., Bot. King's Expl. 190. 1871.

Packera cymbalarioides (Buek) Weber & Löve, **comb. nov.**
Senecio cymbalarioides Buek, Index DC. Prodr. 2:6. 1840.

Packera rosei Weber & Love, based on Senecio rosei Greenman sine diagn. is a nomen nudum.

LITERATURE CITED

- Airy-Shaw, H. K. 1966. J. C. Willis, A Dictionary of the Flowering Plants and Ferns, 7th Ed. Cambridge.
- Babcock, E. V., & G. L. Stebbins, Jr. 1938. The American species of Crepis: their interrelationships and distribution as affected by polyploidy and apomixis. Carnegie Inst. Wash. Publ. No. 504:1-119. 34 fig. 12 tab.
- Babcock, E. B. 1947. The genus Crepis. Parts I, II. Univ. Calif. Publ. Bot. 21-22:1-1030.
- Barneby, Rupert C., & Noel H. Holmgren. 1979. A new species of Lomatium (Apiaceae) from Utah. Brittonia 31:96-100.
- Besser, W.S.J.G. 1829. De Seriphidiis seu de Sectione II-a Artemisiarum. Bull. Soc. Bot. Moscou 2 (p. 222).
- _____. 1834. Tentamen de Abrotanis seu de Sectione II-a Artemisiarum. Mem. Soc. Nat. Moscou 3 (p. 5).
- Boyle, W. S. 1945. A cyto-taxonomic study of the North American species of Melica. Madrono 8:1-26.
- Candolle, A. P. de. 1837. CDXCIX. Artemisia Linn. Prodrum 6:93-127.
- Hall, Harvey M., & Frederic E. Clements. 1923. The phylogenetic method in taxonomy: the North American species of Artemisia, Chrysothamnus, and Atriplex. Carnegie Inst. Wash. Publ. 326:i-iii, 1-355. 58 plates.
- Hooker, W. J. 1833. Flora Boreali-Americana 1:325.
- Irvine, James R., Neil E. West, & A. H. Holmgren. 1978. Rediscovery of Festuca dasyclada and range extensions of Astragalus lutosus and Ceanothus martinii in Colorado. Southwestern Nat. 23:156-157.
- King, Robert M., & Helen W. Dawson (eds.). 1975. Cassini on Compositae. 3 vols. (reprint). Oriole Editions. New York.
- Love, Askill. 1982. IOPB chromosome number reports LXXV: reports by Askill Love and Doris Love. Taxon 31:344-360.
- Mathias, M. E., & Lincoln Constance. 1944-45. Umbelliferae. North American Flora 28B:43-295.
- McArthur, E. D., C. L. Pope, & D. C. Freeman. 1981. Chromosomal studies of subgenus Tridentatae of Artemisia: evidence for autopolyploidy. Amer. J. Bot. 68:589-605.
- Polyakov, P. P. 1961. Materialy k sistematike roda polyin--Artemisia L. Trudy Inst. Bot. AN Kazakhskoy SSR 11:134-177.
- Rogers, C. M. 1968. Yellow-flowered species of Linum in Central America and western North America. Brittonia 20:107-135.
- Shultz, Leila M. 1983. Systematics and anatomical studies of Artemisia Subgenus Tridentatae. Ph.D. Thesis, Claremont.
- Small, John Kunkel. 1907. Linaceae, in North American Flora 25(1):67-87.

Theobald, William L., Charles S. Tseng, & Mildred E. Mathias. 1964. A revision of Aletes and Neoparrya (Umbelliferae). *Brittonia* 16:296-315.

Tzvelev, N. N. 1976. Poaceae URSS. Editio "Nauk", Lenin-grad. 788 pages.

Ward, George H. 1953. Artemisia, Section Seriphidium, in North America: a cytotaxonomic study. *Contr. Dudley Herb.* 4:155-205. Fig. 1-13.

Weber, W. A. 1983. New names and combinations, principally in the Rocky Mountain Flora--III. *Phytologia* 53:187-190.

_____, & Askeell Love. 1981. New combinations in the genus Packera (Asteraceae). *Phytologia* 49:44-50.

ADDITIONS TO THE FLORA OF COLORADO—X

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The last number of this series was published in *Phytologia* 53:191-193. 1983. Three-letter family acronyms are used, following Weber (1982).

NEW RECORDS FOR COLORADO INDIGENOUS TAXA

ASTRAGALUS RAFAELENSIS Jones, Rev. Astrag. 146, Pl. 30. 1923 (FAB). MONTROSE CO.: between Rock Creek and Mesa Creek, Dolores River Canyon, 11 mi N of Uravan, 28 May 1982, Ratzloff (COLO 381859), Uravan, SW of river, NE-facing slope above highway. 20 May 1982, J. Anderson (COLO 387588), 4 mi W of Uravan, Hwy. 141, 1 May 1982, Cudlip 43, S side of Dolores River just before bridge crossing to main highway, 29 May 1982, Weber & Wittmann 10683 (det. Barneby).

GILIA CLOKEYI H. L. Mason, Madrono 6:202. 1942 (PLM). MESA CO.: Grand Mesa between Lands End road and N Fork Kannah Cr., 23-24 May 1981, Siplivinsky 983, 1023; NE of DeBeque, 25 May 1979, Weber et al 1899; 16 km NW of Mack, 25 May 1976, Cronquist 11430. MONTROSE CO.: Roubideau Canyon, 25 May 1978, Johnston et al 21566.

GILIA TRIODON Eastwood, Zoe 4:121. 1983 (PLM). MESA CO.: Grand Junction, Eastwood (COLO 30505); Redlands Road, 17 May 1978, Weber 15322. MOFFAT CO.: Indian Rock, ca. 3 km NNE of Sunbeam, 23 May 1978, Peterson et al 460; 28 mi SE Greystone, 16 June 1978, Weber & Wingate 15403. MONTEZUMA CO.: 22 mi SW of Towaoc, 7 June 1952, Weber 7645. All of these collections had been passing as Gilia leptomeria A. Gray.

GILIA TWEEDYI Rydb., Bull. Torr. Bot. Club 31:634. 1905 (PLM). MOFFAT CO.: ridge separating Conway from Vermilion drainage, between Greystone and Gates of Lodore, 26 June 1965, Weber & Salamun 12616.

LESQUERELLA ARENOSA (Rich.) Rydb. var. ARGILLOSA Rollins & Shaw, Genus Lesquerella in North America, p. 178-179. 1973 (BRA). LOGAN CO.: clay ridges NE of Julesburg (Jumbo) Reservoir, at top of grade crossed by Road 93, N of the Platte River, 1,200 msm, 21 May 1983, Weber & Wittmann 16627, 16635 (flowers), 9 July 1983, R. C. Wittmann 2262 (fruits). Known previously from the Black Hills of South Dakota, Wyoming and Nebraska.

RIBES DIVARICATUM Dougl., Trans. Hort. Soc. London 7:515. 1830 (GRS). BOULDER CO.: Pine Glade School, 22 Aug. 1907, Ramaley 3744; Boulder, April 1908, Ramaley 4680; PARK CO.: upper Buckskin Cr. above Alma, 11,000 ft., 30 Aug. 1940, Ewan 12671. ROUTT CO.: Steamboat Springs, July 1891, Eastwood (COLO 38542). SUMMIT CO.: Blue River Valley 8 mi N of Silverthorne, 2,600 msm, 22 June 1982, Weber & Wittmann 16193. These sheets were determined by Quinn Sinnott, 1982, and had been previously misidentified as R. inerme Rydb.

SCUTELLARIA RESINOSA Torr., Ann. Lyc. N. Y. 2:232. 1828 (LAM). MONTROSE CO.: above Colorado Hwy. 90 less than 2 miles from the Utah State line; below sandstone cliffs, 1,830 msm, 24 May 1979, D. L. & M. L. Denham 74003. This collection presents a distributional anomaly, since according to Epling (1942), S. resinosa does not occur west of western Nebraska and Texas. Geographically, one more likely would expect S. potosina Brandegees, but even here the disjunction is rather major, from central Arizona and southwest New Mexico. I therefore tend to suspect that the plant has been accidentally introduced into western Colorado through earth-moving equipment, but more field observations should be made to determine whether the plant still survives, what the population size is, and the specific nature of the habitat.

ADVENTIVE TAXA

ADENOLINUM GRANDIFLORUM (Desf.) W. A. Weber (LIN). BOULDER CO.: Boulder Mountain Parks, junction of Mesa Trail and Enchanted Mesa Trail; re-seeded area in Pinus ponderosa groves, 1,600 msm, 15 July 1983, R. C. Wittmann 2265. This species, an annual with brilliant red flowers, has been established for many years in California and evidently has come in with "native seed" mixtures used in reclaiming beetle-killed pine land.

RE-EVALUATIONS

HEDYSARUM ALPINUM L. (FAB) was reported for the Gunnison Basin (GN: Needle Creek Valley, Barrell & Sponberg 70-66) by Barrell (1969, p. 269). Two specimens were deposited in US, one of these since transferred to COLO. We have examined them, and

find that were misidentified. They represent Astragalus bisulcatus (Hook.) A. Gray ssp. bisulcatus. The plants lack mature fruit but the flowers have typical curved Astragalus keels and lack the characteristic stipules of Hedysarum.

REFERENCES

Barrell, Joseph. 1969. Flora of the Gunnison Basin: Gunnison, Saguache and Hinsdale counties. Natural Land Institute, Rockford, IL.

Epling, Carl. 1942. The American species of Scutellaria. Univ. Calif. Publ. Bot. 20:1-146.

Weber, William A. 1982. Mnemonic three-letter acronyms for the families of vascular plants: a device for more effective herbarium curation. Taxon 31:74-88.

UNA HELICONIA NUEVA DE COLOMBIA

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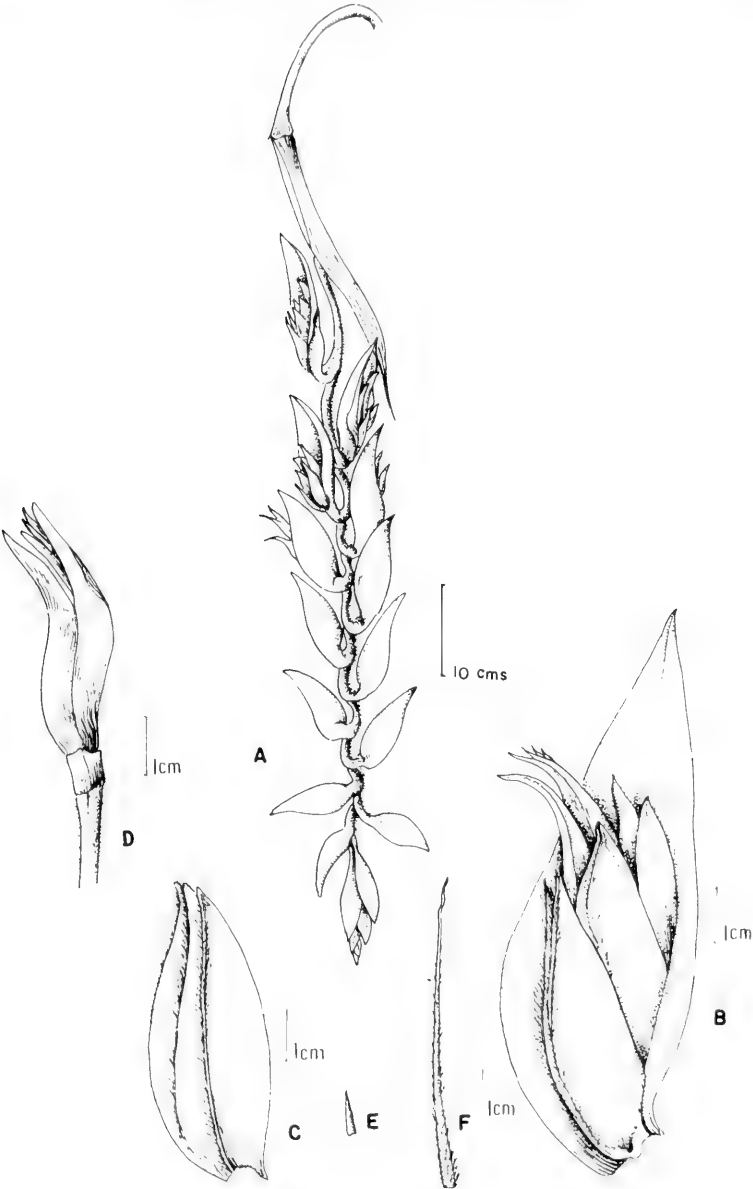
El presente trabajo reporta el hallazgo de una nueva especie del género *Heliconia*, de material coleccionado al sur del Departamento del Huila en el Valle de Laboyos. Para el sistema de medidas e ilustraciones se ha mantenido el mismo patrón que se utilizó en publicaciones anteriores (Abalo & Morales L., 1982; Abalo & Morales L., 1983). Todas las medidas e ilustraciones están basadas en material vivo.

Debido al gran número de especies encontradas, se hicieron intentos para establecer un banco de germoplasma en Colombia, pero no fué posible continuarlo por carencia de recursos y por falta de instituciones nacionales que contemplen la instauración de este tipo de programas.

Heliconia abaloï Morales, sp. nov.

Planta musoides. Pseudocaulis 1.5 - 2.3 m altus. *Petiolus* 45 - 140 cm longus. *Lamina* 110 - 170 cm longa, 24 - 40 cm lata. *Inflorescentia pendula. Pedunculus ruber, pubescens. Rachis rubra, pubescens. Spathae rubrae, aureomarginatae, distichae, reflexae. Perianthium luteum, gibbosum, 4.5 - 5.0 cm longum. Pedicellus laete pubescens. Ovarium luteolum. Rudimentum aristoides adest.*

Planta musoide. Pseudotallo 1.5 - 2.3 m. Hojas 5 - 6, pecíolo 45 - 140 cm de largo, glabro; lámina 110 - 170 cm de largo por 24 - 40 cm de ancho, base inequilátera semicordada, ápice obtuso. Inflorescencia péndula, 55 - 120 cm de largo; pedúnculo y raquis rojos con pubescencia marrón, pedúnculo 15 - 35 cm de largo; raquis 40 - 85 cm de largo. Espatas externamente rojas con el borde amarillo, internamente rojo - naranja, 13 - 20 por inflorescencia, ligeramente pubescentes en la base, el resto glabro, borde involuto en la parte inferior y ondulado hacia el ápice, reflexas, dísticas aunque la inflorescencia experimenta una rotación por presión entre espatas al reflexionarse; la primera espata basal estéril o fértil, 12 - 24 cm de largo por 3.5 - 4.0 cm de ancho; espatas medias 8.5 - 13.5 cm de largo por 3.5 - 4.5 cm de ancho en la parte media. Brácteas amarillo claro, carinadas, pubescentes exteriormente, 4.- - 6.0 cm de largo por 2.0 - 2.3 cm de ancho en la parte media



HELICONIA ABALOÏ

y extendidas. En algunas espatas entre la segunda y tercera brácteas puede aparecer un rudimento aristiforme amarillo, muy pubescente, 4.0 - 7.5 cm de largo. Flores 12 - 15 por espata; perianto amarillo, giboso, 4.5 - 5.0 cm de largo, sépalos pubescentes en los bordes y líneas del dorso, pétalos glabros; estaminodio amarillo claro, lanceolado de ápice agudo, 0.6 cm de largo por 0.15 cm de ancho en la parte media; ovario amarillo claro, glabro; pedicelo amarillo claro con pubescencia marrón, 1.3 - 2.0 cm de largo. Frutos amarillos, azules al madurar; pedicelos de los frutos 3.0 - 4.0 cm de largo.

Observaciones: A pesar de ser una *Heliconia* sin especies afines, *Heliconia dielsiana* Loes. es una de las especies mas cercanas, pero se distingue facilmente ya que ésta posee entre otras diferencias espatas espiraladas, mas largas y delgadas en la parte media y borde de la espata revoluto.

Tipo: Gustavo Morales & José Abalo 263, 18 Agosto 1981, Colombia, Departamento Huila, Pitalito, 9 Km vía La Mesa de Elías, altura 1380 msm. (COL, holotipo; MY, US, isotipos)

Esta especie, una de las mas atractivas, está dedicada a José Eduardo Abalo, quien ha hecho loables esfuerzos por establecer un cultivo para conservación de germoplasma de *Heliconias* y proteger así algunas especies que se encuentran en peligro de extinción; ha permitido el incremento de las colecciones de *Heliconias* principalmente en el Neotrópico; ha facilitado ejemplares de herbario a numerosas instituciones y trabajado como coautor en varios artículos sobre nuevas especies de *Heliconias*.

Habitat: Zonas de precipitación media. Suelos arcillosos con alto contenido de materia orgánica. Sitios semi-abiertos. Terrenos planos con tendencia a anegarse.

LITERATURA CITADA

- Abalo, J. E. & Morales L., G. 1982. Veinticinco (25) *Heliconias* Nuevas de Colombia. *Phytologia* 51 (1) 1 - 61
- Abalo, J. E. & Morales L., G. 1983. Doce (12) *Heliconias* Nuevas del Ecuador. *Phytologia* 52 (6) 387 - 413

KARYOTAXONOMIC STUDIES ON WILD BOLIVIAN
TUBER-BEARING *SOLANUM*, SECT. *PETOTA*. I.

C. Ochoa*

The wild tuber-bearing *Solanum* from Bolivia are one of the least known groups of the Sect. *Petota*, subsect. *Potatoe*. Here, the author gives some results of his studies, including field observations of morphology and habitat, geographical distribution, and chromosome number counts. Extensive examination of material deposited in European and North and South American herbaria was also made. The species have been grouped into seven series, and the synonyms are given for each species. The synonyms cited here are only the ones identified for each species within the Bolivian territory.

I. SERIES ACAULIA Juz., Bull. Acad. Sci. U.R.S.S., ser. Biol. 2:316. 1937, *nom. nud.*; ex Buk. & Kameraz, Bases of Potato Breeding, 21, 1959.

1. *Solanum acaule* Bitt., Rept. Sp. Nov. 11:391-393, 1912.

S. acaule var. *subexinterruptum* Bitt., Rept. Sp. Nov. 11:393-394, 1912.

S. acaule var. *caulescens* Bitt., Rept. Sp. Nov. 12:453-454; 1913.

S. uyunense Card., Bol. Soc. Peruana Bot. 5: 33-35, 1956.

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The variability of this species has led to the naming of new entities in specific and intraspecific levels. Apparently, its natural crossability with other species across a wide geographical distribution (Argentina, Bolivia and Peru) has contributed to this diversity. All of the living collections of *S. acaule* made by the author in Bolivia have $2n=4x=48$ chromosomes.

II. SERIES CIRCAEIFOLIA Hawkes, Ann. and Mag. Nat.
Hist., ser. 12, 7:702. 1954.

2. *Solanum circaeifolium* Bitt. Repert. Sp. Nov.
11:385-386, 1912.

Plant delicate, stem slender, long stolones and small white tubers, leaves glabrous or glabrescent to finely pubescent with simple blade or odd-pinnate with 1-2(-3) pairs of lateral leaflets. Flower white, corolla stellate to substellate. Fruit long-conic of acute apex. Distribution: From the surroundings of Sorata, 2650m, alt. in the department of La Paz, northwest Bolivia, towards the heights of Choro-Ayopaya, 3900m alt. in the department of Cochabamba and the vicinities of Valle Grande in the department of Santa Cruz, central-south Bolivia, mostly in cloud forest and scrub vegetation, in the shade of thickets or among rocks or stony soil on steep brush slopes. Chromosome number $2n=2x=24$. This species is divided into the following varieties:

2a. *Solanum circaeifolium* var. *circaifolium*

Plant up to 70cm tall, stem slender, weakly ascending, usually glabrous, flexuous, simple or branched; leaf rather long petiolate, usually glabrous, rarely glabrescent, simple or little dissected with

1-2 of very small lateral folioles and no interjected leaflets; pedicel somewhat puberulent articulated well above or near the middle, calyx slightly puberulent, style densely papillose on the lower half, filaments glabrous.

- 2b. *Solanum circaeifolium* var. *capsicibaccatum* (Card.)
Ochoa comb. nov.

Solanum capsicibaccatum Card., Rev. Agr. Cochabamba, 2:35-36, 1944.

Compared with typical variety, var. *capsicibaccatum* has more and finer pubescent leaves, always with 1 or 2 pairs of lateral leaflets, narrower and longer elliptic folioles, style papillose or sometimes with scattered short hairs on lower half. This variety also has greater geographical and ecological distribution than var. *circaeifolium*. Chromosome number: $2n=2x=24$.

- 3b. *Solanum circaeifolium* var. *latifoliolatum* (Ochoa)
Ochoa comb. nov.

Solanum circaeifolium f. *lobatum* Corr., Wrightia 2:171, 1961.

Solanum capsicibaccatum Card. var. *latifoliolatum*
Ochoa, Phytologia 50(3):181-182, 1982.

With a large and very widely elliptic lanceolate terminal foliole and more well dissected leaves, 2-3 lateral pairs, very rarely as many as four pairs, pubescent, coarse hairs, mainly in the upper surface of the leaflets. Restricted to the Quime region in the province of Inquisivi in the department of La Paz. Chromosome number: $2n=2x=24$.

- III. SERIES COMMERSONIANA Buk., Bull. Acad. Sci. U.R.S.C., ser. Biol. 2:714. 1938, *nom. nud.*; ex Buk. & Kameraz, Bases of Potato Breeding 19, 1949.

SERIES GLABRESCENTIA Buk., Problemy Bot. 2, 1955 *nom. nud.*; ex Buk. & Kameraz, Bases of Potato Breeding 19, 1959.

SERIES TARIJENSA Corr., Tex. Res. Found. Contrib. 4:233, 1962.

SERIES YUNGASENSA Corr., Tex. Res. Found. Contrib. 4:220-222, 1962.

3. *Solanum berthaultii* Hawkes, Bull. Imp. Bur. Plant Breed. & Genet., Cambridge, 122, 1944.

Plants tall, branched, light green, very glandulous and pubescent. Corolla pentagonal to substellate from white or whitish to pale violet-blue. More closely related to *S. tarijense* than to any other species. Mostly in dry valleys of the eastern slopes of the Cordillera of Cochabamba or Tunari, towards Aiquile and Sucre, 2000-2800m alt., among *Acacias* and *Schinus* or in brushy mountain slopes and stony clayey soils. Chromosome number: $2n=2x=24$.

Prof. J.G. Hawkes has postulated that the probable origin of *S. berthaultii* is from a hybridization between *S. tarijense* and some blue-flowered mountain species from the Tuberosa series. However, up until now, it has not been possible to satisfactorily reproduce artificial hybrids similar to *S. berthaultii*, even when using *S. tarijense* in crosses with *S. sparsipilum*.

4. *Solanum chacoense* Bitt., Repert. Sp. Nov. 11:18, July, 1912.
S. caipipendense Card., Bol. Soc. Peruana Bot. 5(1-3):35-36, 1956.
S. cuevoanum Card., Bol. Soc. Peruana Bot. 5(1-3):36-37, 1956.
S. arnezii Card., Bol. Soc. Peruana Bot. 5(1-3):37-40, 1956.
S. chacoense f. *caipipendense* (Card.) Corr., Wrightia 2:172, 1961.

Plants up to 1m or more tall in shade and thickets, and 15-20cm tall in open fields. Leaves usually with 4-5 lateral pairs. Corolla stellate or substellate to pentagonal, pure white to yellowish or white with mauve acumens; small calyx with very short, almost apiculate, acumens. Fruits globose to ovate, light green spotted with small white spots.

Solanum chacoense is a highly variable species. Therefore, many taxa of different ranks have been created which has greatly confused its taxonomy. It is also the most widely distributed tuber-bearing species after *S. acaule* and has been found as a weed in many different places in Argentina, Brazil, Paraguay, Uruguay and southern Bolivia.

Although triploid forms of *S. chacoense* have been reported, the material collected by the author in Bolivia is exclusively diploid, $2n=2x=24$ chromosomes.

5. *Solanum tarijense* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 114-115, 1944.

Solanum zudaniense Card., Bol. Soc. Peruana Bot., 5:31-32, 1956.

Solanum trigalense Card., Bol. Soc. Peruana Bot.,
5:41-42, 1956.

Solanum berthaultii f. *zudanense* (Card.) Corr.,
Wrightia 2:184, 1961.

Plants of 60-80cm tall, aromatic, pubescent and puberulent, glandular. Leaves with 3-4 lateral pairs and several to many interstitial leaflets. Corolla stellate to substellate or pentagonal, always white or creamy white, calyx with long acumens. Fruit globose, green with scattered white spots.

Habitat is mostly in low, dry valleys with *Acacia* and *Schinus* trees associated with herbs in sandy loam soil. Between 2500-300m alt. Distribution: from the southeast of Cochabamba, Bolivia, to Catamarca Province in northern Argentina. All of the living material of *S. tarijense* collected by the author within the Bolivian boundary have $2n=2x=24$ chromosomes.

5a. *Solanum tarijense* var. *pojoense* (Card.) Corr.,
Wrightia 2:173, 1961.

Solanum vallegrandense Card., Bol. Soc. Peruana
Bot. 5:23, 1956.

Solanum vallegrandense var. *pojoense* Card., Bol.
Soc. Peruana Bot. 5:24, 1956.

Plants less vigorous than in the typical species, smaller and fewer dissected leaves, corolla stellate, only creamy white, calyx also smaller in the typical species. Distribution: mainly in Santa Cruz and Tarija, Bolivia, up to the Province of Salta in north Argentina. Chromosome number: $2n=2x=24$.

6. *Solanum yungasense* Hawkes, Ann. and Mag. Nat. Hist., ser. 12, 7:697, 1954.

Plant glabrous to sparsely pubescent, erect or decumbent nearly up to 2m tall; stem slender to stout, usually branched, widely winged, wings straight or sinuous; tubers white, 3.0-4.0cm long and 2.0-2.5cm thick. Leaves light green, long and narrow with 6-7 pairs of lateral leaflets narrowly lanceolate, few small interstitial leaflets. Corolla deeply stellate, 2.0-2.5cm diameter with narrow and long lobes. Fruit globose, light green, 1.5cm in diameter.

This species lives in a similar ecological area as *Solanum violaceimarmoratum* of the Conicibaccata series, but both are quite different. Habitat: in tropical or subtropical forests where the rainfall is abundant and the temperature varies from mild to rather warm. Distribution: from Nor Yungas of La Paz to the tropical region near Tambopata River in the Peruvian Department of Puno at 1300-1800m alt. where this species has been identified by the author for the first time. The ploidy level varies from $2n=2x=36$ chromosomes.

7. *Solanum flavoviridens* Ochoa, Am. Pot. Journal 57(8):387-390, 1980.

Plant vigorous, broadly spreading, stout, greenish-yellow, very glandulous, nearly 1m tall. Stem robust, erect, simple or branched, pilose. Leaves covered with dense, simple and glandular hairs as in *Solanum berthaultii*. Corolla substellate to pentagonal, white or creamy white. Fruit globose. Growing at edges of forests or thickets in the tropical regions of Camata, 1600-1800m alt., in the Province of Saavedra, Department of La Paz.

This species seems to be of a hybrid origin, involving species of the series *Commersoniana*. If such would be the case, the progenitors could be *S. yungasense* crossed with a white-flowered form of *S. berthaultii*, or perhaps some unknown species, since the locality of *S. berthaultii* is distant and quite unlike the habitat of *S. flavoviridens*. Until further information is obtained, we prefer to maintain *S. flavoviridens* as it is.

8. *Solanum litusinum* Ochoa, Phytologia 48(3):229-232, 1981.

Plant up to 1m tall, erect; stem usually branched, sparsely pilose, winged. Leaves with few glandular hairs, 2-3 pairs of lateral folioles and 0-2 small interjected leaflets. Calyx light green, pubescent, with acuminate lobules. Corolla stellate, purple. Fruit globose to ovate, green. Growing in subtropical regions below 2000m alt. in low, rather dry, stony ravines near river banks of La Playa in the Province of Valle Grande, Department of Santa Cruz. Chromosome number: $2n=2x=24$.

- IV. SERIES CONICIBACCATA Bitt., Repert. Sp. Nov. 11: 381, 1912.

SERIES OXYCARPA Rydb., Bull. Torrey Bot. Club 51:146, 172, 1924.

9. *Solanum violaceimarmoratum* Bitt., Repert. Sp. Nov. 11:389. 1912.

Solanum violaceimarmoratum var. *papillosum*
Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet. Cambridge 12, 14, 113, 1944.

Plant up to 2-3m tall, stem slender, flexuous, often densely mottled with light purple, glabrous or slightly puberulent. Leaves pubescent, 2-4 pairs of lateral leaflets, and 0-4 interjected leaflets. Corolla rotate to rotate-pentagonal 2-3cm in diameter, bright purple to violet, calyx 1cm long, glabrous to glabrescent. Fruit long conical with obtuse apex, 2.0-2.5cm long, pure green. Growing in cloudy forest, thickets, near streams, clearings of woods at 1800 to 3600m alt. Distribution: from Unduavi, Nor Yungas of La Paz up to Colomi and Incachaca in the Province of Chapare, Department of Cochabamba. In my opinion, *S. violaceimarmoratum* is quite different from the southern Peruvian species *S. buesii*, *S. santolallae* and *S. urubambae*, as well as from *S. laxissimum* of central Peru. Chromosome number: $2n=2x=24$.

- V. SERIES CUNEOALATA Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge 118, 1944.

10. *Solanum infundibuliforme* Phil., Anal. Mus. Nac. Chile, 2nd ed. Bot., 65, 1891.

Solanum infundibuliforme var. *angustepinnatum*
Bitt., Repert. Spec. Nov. 11:388, 1912.

Solanum platypterum Hawkes, Bull. Imp. Bur. Plant Breed. & Genet., Cambridge, 118, 1944.

Solanum microphyllum Hawkes, Bull. Imp. Bur. Plant Breed. & Genet., Cambridge, 118, 1944 (not *S. microphyllum* Dun., 1813).

Solanum glanduliferum Hawkes, Bull. Imp. Bur. Plant Breed. & Genet., Cambridge 118-119, 1944.

Solanum pinnatifidum Card., Rev. Agric., Cochabamba 2(2):33, 1944 (not *S. pinnatifidum* Lam., 1797; not Ruiz and Pavon, 1799).

Solanum xerophyllum Hawkes, J. Linn. Soc., Bot.,
53, 108, 1945.

Solanum infundibuliforme var. *albiflorum* Ochoa,
Phytologia, 46(4):223, 224, 1980.

Plant usually small, less frequently up to 30-40cm tall, stem erect or decumbent, simple or branched. Leaf imparipinnatisect to imparipinnate or sometimes lyrate; lateral leaflets usually 2-3 pairs decurrent on the rachis, linear or linear-lanceolate to lanceolate or narrowly elliptic-lanceolate. Corolla extremely variable in color and shape, from white to dark purple and from rotate to rotate-substellate.

Fruit globose, green or green mottled with white. Habitat: from subxerophytic scrub desert associated with cactus or thorny shrubs of low regions to colder and wet places of high mountains or puna associated mainly with *Stipa ichu*, 2400-4100m alt. Distribution: from northwest Argentina, south and central Bolivia to the northern Chile. Chromosome number: $2n=2x=24$.

VI. SERIES TUBEROSA Rydb., Bull. Torrey Bot. Club 51:146-148, Buk. & Kameraz, Bases of Potato Breeding 18, 1959, sensu stricto. 1924, nomen nudum.

SERIES ANDIGENA Buk. *ibid* 24, 1959.

SERIES TRANSAEQUATORIALIA Buk. *ibid*. 21, 1959.

SERIES VAVILOVIANA Buk. *ibid*. 18, 1959.

SERIES ANDREANA Hawkes, Bull. Imp. Bur. Plant Breed. Genet. Camb. 50, 1944.

11. Solanum alandiae Card., Bol. Soc. Peruana Bot. 5:11, 1956.

Solanum torrecillasense Card., Bol. Soc. Peruana Bot. 5:15, 1956.

Plant stout, branched, light green. Stem erect or sub-decumbent, glabrescent, widely winged. Leaves odd-innate, 2-3-(4) pairs of folioles, 0-4 interstitial leaflets; terminal leaflet much larger than the laterals widely elliptic-lanceolate with acute apex and rounded base; pseudoestipular leaves; very large, showy flowers. Corolla subpentagonal, dark lilac, articulation of the pedicel above the middle or near the calyx. Fruit globose to ovate, green with sparse, small, white spots. Distribution: inter-Andean valleys of central Bolivia, from north of Chuquisaca to east of Cochabamba, between 2000 and 2600 m alt., common near cultivated fields, streams and thickets. Chromosome number: $2n=2x=24$.

12. Solanum oplocense Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 119, 1944.

Plant rather small, 30-40cm tall, erect to decumbent, mostly rosette at the base when young; stem simple or branched with very narrow wings. Leaves with 3-4 pairs of lateral leaflets, coarsely pilose including the margins, 0-3 interstitial leaflets; lateral leaflets ovate to wide elliptic or elliptic, usually obtuse apex, rounded to broadly cuneate base; first upper pair of folioles decurrent on the rachis. Corolla violet, light purple or slightly bluish, pentagonal to substellate; articulation of the pedicel near the middle or slightly below the middle. Fruit globose to ovate, dark green with sparse, small, white spots. Distribution: from the Provinces of Mizque and Campero, south of Cochabamba, 2200m alt., to the heights of Oro Ingenio near 4000m alt. in the Province of Nor Cinti, Potosi, in Bolivia, as far south as the vicinities of Humahuaca in the Argentine Province of Jujuy at 3500m alt. Although it has usually been found in lower altitudes, associated with Cactaceae and other xerophytic or subxerophytic plants, it also grows in cold puna regions together with Stipa ichu, Werneria, Astragalus, and other

plants endemic to high altitudes. Chromosome number: although the chromosome number for this species has been reported to be diploid, that is, $2n=2x=24$ chromosomes including the samples originally collected in the type locality, the countings made in all the living collections studied here have two ploidy levels: $2n=4x=48$ or $2n=6x=72$ chromosomes.

13. *Solanum vidaurrei* Card., Bol. Soc. Peruana Bot.
5:26-30, 1956.

Plant very gracile, 15-60cm tall; stem erect, simple or branched, slender, sparsely pilose, without wings or with very narrow decurrent lines. Leaves with 3-4-(5) pairs of lateral folioles, linear lanceolate or narrowly elliptic-lanceolate, coarsely pilose like the margins which are slightly denticulate; the first upper pair of folioles decurrent on the rachis; interjected leaflets 0-5. Corolla subpentagonal to pentagonal or sometimes rotate, dark lilac to purple. Fruit globose to ovate, up to 2cm in diameter, dark green mottled with scattered white spots. Distribution: although the altitudinal limits of *S. vidaurrei* are between 2600 and 3400m alt., this species inhabits mostly xeric valleys of 2600-2800m alt., where the climatic conditions are rather mild and dry, growing associated mainly with Cactaceae and thorny plants. Its geographical distribution extends from south Bolivia to Santa Victoria in northern Argentina, right near the border with Bolivia. Chromosome numbers: two ploidy levels have been found $2n=2x=24$ and $2n=4x=48$ chromosomes.

14. *Solanum brevicaule* Bitt., Repert. Sp. Nov. 11: 390-391, 1912.

Solanum liriunianum Card. et Hawkes, Journ. Linn. Soc. Bot. 53:106-108, 1945.

Solanum colominense Card., Bol. Soc. Peruana Bot. 5:21-23, 1956.

Solanum achacachense Card., Bol. Soc. Peruana Bot. 5:30-31, 1956.

Plant usually low, 20-25(-60)cm tall, bushy or erect spreading, densely and coarsely pilose along the stem, rather stout, simple or branched slightly rosette and flexuous at the base. Leaves coarsely pubescent, 3-4(-5) pairs of lateral folioles and few to many interjected leaflets. Folioles broadly ovate-elliptic to elliptic-lanceolate, apex obtuse to subobtuse or acuminate; base oblique, broadly rounded or very rarely subcordate. Pedicel articulation is not constant, sometimes above the middle, others near the middle or even below. Corolla rotate 3.5cm in diameter, dark purple to bluish-violet; fruit globose to ovoid, dark green, 2cm in diameter. Distribution: although *S. brevicaule* is found in almost all the Bolivian territory, from the highlands in the vicinities of La Paz at almost 4000m alt. to the valleys near Cochabamba, Sucre and Tarija between 2600 and 3000m alt., it is also found in the mountainous regions of the Provinces of Jujuy and Salta in Argentina. Thus, this species not only grows in Andean humid slopes, but it is also frequently found in lower and dryer ecological formations. $2n=2x=24$.

15. *Solanum leptophyes* Bitt., Repert. Sp. Nov. 12: 448-449, 1913.

Solanum spigazzinii Bitt., Repert. Sp. Nov. 12: 449-450, 1913.

Solanum gourlayi Hawkes, Bull. Imp. Bur. Pl.

Breed. & Genet., Cambridge, 120-121, 1944.

Solanum pachytrichum Hawkes, Bull. Imp. Bur. Pl.

Breed. & Genet., Cambridge, 121-122, 1944.

Solanum punoense Hawkes, Bull. Imp. Bur. Plant

Breed. & Genet., Cambridge, 123, 1944.

Plant small, 10-15(-35)cm tall, gracile; stem slender, erect, branched, slightly flexuous and shorter internodes towards the base, sparsely pilose. Leaves usually long and narrow, sparsely pilose, 4-5(-7-8) pairs of lateral folioles, (0-)5-11(-16) interjected leaflets; folioles usually narrowly elliptic-lanceolate or occasionally almost widely elliptic, obtuse or sub-acute apex, obliquely rounded to cuneate base. Peduncles short 2-4cm long, pedicel articulation near or above the middle.

Corolla rotate to subpentagonal, violet to light purple or violet-purplish. Fruit globose to ovoid green with 1 or 2 purple stripes. Distribution: widely distributed from the northwest of Argentina throughout Bolivia to the interior of southern Peru as far as the Province of Antabamba in the Department of Ayacucho in Peru. It habits xeric or subxeric valleys, growing in poor and stony soils together with *Acacia* sp and Cactaceae at altitudes of 2600-3000m. It extends to high, humid, Andean valleys up to nearly 4000m alt. Chromosome number: $2n=2x=24$.

16. *Solanum candolleanum* Berth., Ann. Sci. Agron. et Etrang. 3 Ser. 6th year, Vol. 2:184-185, 190. Paris, 1911.

Solanum mandonii A. DC., Bibl. Univ., Arch.

Sci. Phys. et Nat., ser. 3, 15:438. 1886

(not *S. mandonis* van Heurk et Muell. in Heurk, Obs. Bot., 78, 1870).

Plant large, very robust, erect, more or less pubescent throughout, 1 m tall or more, stem thick, usually branched, widely winged. Leaves large and highly dissected, 4-5(-6) pairs of narrow lateral folioles and numerous interjected leaflets, folioles with subobtuse to subacuminate or acuminate apex, rounded to obliquely rounded base. Pedicel articulation well above the middle or to 6-7 mm below the calyx; calyx pilose with lanceolate lobes and long acumens; corolla rotate, large deep blue or dark purple; fruit globose to ovoid, large, 3.5 cm in diameter, green at the base, light green to almost whitish towards the apex, sometimes very sparsely mottled with white spots. Distribution: growing abundantly in the Bolivian provinces of Larecaja and Franz Tamayo, Department of La Paz, and also in the other side of Cordillera de Apolobamba, behind the great Palomani Peak in the Peruvian territory of the Puno Department. The altitudinal limits of this species are between 2700-3700 m. Grows in thickets, near river or stream banks, in shrubby crevices of medium altitude valleys or even in colder regions of puna limit near the *Stipa ichu* steppe. In addition to its similar geographical distribution and its great vegetatively resemblance of the foliage to some forms of *S. tuberosum* subsp. *andigena*, *S. candolleianum* produces abundant and very large tubers, up to 14 cm long, ovate or flat-ovate. It is quite possible that this species has played an important role in the evolution of some cultivated species. Chromosome number: two ploidy levels, $2n=2x=24$ and $2x=3x=36$.

17. *Solanum sparsipilum* (Bitt.) Juz. et Buk., in Vavilov, Theor. Bases Plant Breed., 3:11, 1937.

Solanum tuberosum subsp. *sparsipilum* Bitt.,
Repert. Spec. Nov. 12:152, 1913.

- Solanum sucrense* var. *brevifoliolum* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 51, 1944 nom. nud.
- Solanum anomalocalyx* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 126-127, 1944.
- Solanum brevimucronatum* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 127, 1944.
- Solanum lapazense* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 127-128, 1944.
- Solanum mollepujroense* Card. et Hawkes, Jour. Linn. Soc., Bot. 53:103, 1945.
- Solanum anomalocalyx* var. *llallaguanianum* Card. et Hawkes, Jour. Linn. Soc. Bot. 53:104, 1945.
- Solanum anomalocalyx* var. *brachystylum* Card. et Hawkes, Jour. Linn. Soc. Bot. 53:104, 1945.
- Solanum anomalocalyx* var. *murale* Card. et Hawkes, Journ. Linn. Soc., Bot. 53:106, 1945 (as var. *muralis*).
- Solanum ruiz-zeballosii* Card., Rev. de Agricultura, Cochabamba 11:13-14, 1968.

Plant vigorous, more than 1m tall, stem stout, erect to erect-ascending, usually branched, pilose throughout with scattered coarse hairs. Leaves with 3-4(-5) lateral folioles and with or without several interjected leaflets; folioles ovate-elliptic to broadly elliptic, narrowly decurrent on the rachis especially in the upper pair, obtuse to shortly acuminate apex, cuneate or rounded at the base. Pedicels articulated near or above the middle. Calyx rather small, 5-6mm, symmetric or asymmetric (bilabiate) with broadly elliptic-lanceolate apiculate lobes. Corolla rotate or rotate-pentagonal, usually small, 3cm in diameter, dark purple to violet or light blue. Fruit light green, 12-15mm in diameter.

Solanum sparsipilum grows usually as a weed in cultivated fields and waste places. It is a highly variable species. The author estimates that there are at least 10 synonyms in Bolivia alone, and 4 more in the Peruvian territory. Its general morphology bears a great resemblance to some representative forms of the cultivated tetraploid Group *Andigena* or *Solanum tuberosum* subsp. *andigena* (Juz. et Buk.) Hawkes. Therefore, it has been postulated that it has played an important role in the evolution of some of the cultivated species. Distribution: from southern Peru to central Bolivia, mostly in inter-Andean temperate valleys 2400-3000 m alt., in or near cultivated fields, grassy banks, waste places, and stone walls near farm houses. It can also be found, although with less frequency, at higher altitudes and in colder climatic conditions up to nearly 4200 m alt. Chromosome number: $2n=2x=24$.

18. *Solanum gandarillasii* Card., Bol. Soc. Peruana Bot. 5(1):16-20, 1956.

Plant small, bushy and spreading, 20-25 cm tall, light green, glabrous or glabrescent. Stem slender, suberect to semirosette. Leaves with 1-2(-3) lateral folioles and no interjected leaflets; terminal foliole very enlarged, lateral leaflets broadly ovate or broadly elliptic-lanceolate, rounded to subcordate at the base, obtuse to shortly acuminate at the apex. Pedicels articulate well above the middle; calyx strongly reflexed, widely oblong spatulate or liguliform leafy lobes; corolla rotate, white, small up to 2.5 cm in diameter. Fruit globose to ovoid, light green, sparsely white spotted, 15 mm long. Distribution: found only in central and southeastern Bolivia, Departments of Cochabamba, Chuquisaca and Santa Cruz, between 2000-2800 m mostly in xeric regions, in dry rocky soils associated with Cactaceae and *Acacia* forests or under thorny bushes. Chromosome number: $2n=2x=24$.

19. *Solanum sucrense* Hawkes, Bull. Imp. Bur. Pl. Breed. & Genet., Cambridge, 126, 1944.

Plant vigorous, stem stout, erect, branched, winged; leaves 3-4(-5) pairs of lateral folioles, 4-6 interjected leaflets; folioles widely elliptic-lanceolate to elliptic-lanceolate with long petioles. Pedicel articulation near or above the middle. Corolla light bluish-violet, 2.5-3.0 cm in diameter, pentagonal to sub-stellate with long, poorly delimited acumens; calyx small regular to symmetric or strongly bilabiate with shortly acuminate lobes. Fruit globose, 1.5-2.0 cm in diameter, deciduous, dark green or dark green mauvish towards the apex.

Solanum sucrense is considered a "weedy" species and vegetatively has a great resemblance to *S. sparsipilum* and to some forms of *S. tuberosum* subsp. *andigena*. Therefore, it may have played a role in the evolution of the cultivated species *S. tuberosum*, and as in the latter, it also has $2n=4x=48$ chromosomes.

In addition, my collection No. 11926, which is a topotype of *S. sucrense*, is highly valuable for its extreme resistance to all Potato X viruses, including PVX_{HB} (Brown, C.R., L. Salazar, C. Ochoa & C. Chuquillanqui, paper in print). Also, *Solanum sucrense*, in spite of being tetraploid, is self-incompatible but crosses easily with tetraploid cultivars, thus giving a new route in breeding for resistance against the PVX complex. Distribution: found only in Central Bolivia, Department of Chuquisaca, near Sucre, between 2600-3000 m alt. Growing in cultivated fields or as a garden weed, edges of corn fields or crevices of old walls. Common name "Alcco papa."

VII. SERIES MEGISTACROLOBA Card. et Hawkes, Jour. Linn. Soc., Bot. 53:93, 1945.

20. *Solanum boliviense* Dun. in DC., Prodr. 13(1):43, 1852.

Plant subrosette or caulescent, erect-ascending or spreading prostrate, sparsely pilose with coarse hairs; stem simple or branched, leaves simple or with a pair of very small, lateral folioles; leaf blade or terminal foliole large, elliptic to ovate or elliptic-lanceolate, obtuse to acute apex, broadly rounded to narrowly cuneate at base. Articulation of the pedicel above the middle. Corolla rotate-pentagonal to pentagonal, deep purple. Fruit globose, 2cm in diameter, usually dark green. Distribution: from Chuquisaca Department in central Bolivia to the Province of Salta, Department of Santa Victoria into northwest Argentina at altitudes of 1700-3400m. In wet forest edges, among shrubs in sand-clayey soil, stony slopes, common in crevices under humid forests of *Polylepis*, and also in higher altitudes associated with *Stipa ichu*. Chromosome number: $2n=2x=24$.

21. *Solanum megistacrolobum* Bitt., Repert. Sp. Nov. 10:536, 1912.

Solanum alticola Bitt., Repert. Spec. Nov. 12:5-6, 1913.

Solanum decurrentilobum Card. et Hawkes, Jour. Linn. Soc., Bot. 53:97-98, 1945.

Solanum toralapanum Card. et Hawkes, Jour. Linn. Soc., Bot. 53:98-99, 1945.

Solanum ellipsifolium Card et Hawkes, Jour. Linn. Soc., Bot. 53:100-101, 1945.

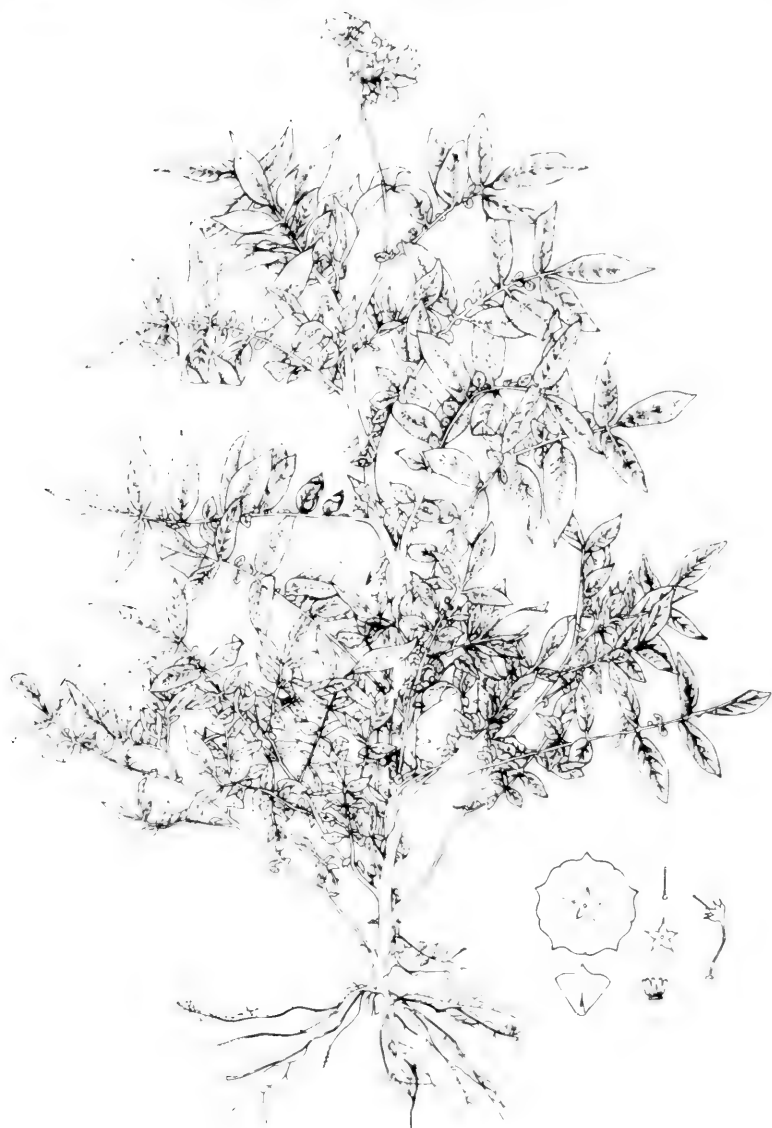
Solanum toralapanum var. *subintegrifolium* Card. et Hawkes, Jour. Linn. Soc. Bot. 53:99-100, 1945.

Solanum ureyi Card., Bol. Soc. Peruana Bot., 5:32-33, 1956.

Plant small, usually forming a rosette or less frequently suberect-ascending; stem weakly angled and straggling, sparsely to densely pilose. Leaf simple to oddpinnate or pinnatilobed to sublyrate with 0-1-3 (-5) small lateral folioles; terminal foliole usually very large and extremely variable in shape from sub-orbicular to broadly elliptic or oval-elliptic, or from oblong or oblanceolate to lanceolate, sometimes also rhomboid and even longly subespatulate, broadly rounded to obtuse-apiculate or very rarely subacute at the apex, broadly rounded to cuneate at the base; lateral folioles similar in shape to the terminal, but much smaller, sessile, and basiscopically decurrent on the rachis. Pedicel articulation above the middle or rather near the calyx. Corolla rotate or subrotate to pentagonal or rotate-stellate, purple to lilac. Fruit globose to broadly ovoid compressed, dark green, 2.5 cm in diameter.

Solanum megistacrolobum represents the type species of the series. Because it is very heterogeneous and variable, it has caused great difficulties in its classification. Some of the taxa listed above as synonyms could probably be transferred, in the future, to a lower rank, as a *variety* or a *form*, but should no longer be maintained as *species*. Distribution: this is a typical, high mountain species growing mostly between 3000-4000 m alt., in humid highlands on grassy banks, stone walls, among wet bushes and along streams; from the high plateau of the Cailloma Province, Department of Arequipa, and Lake Titicaca region of southern Peru through Bolivia to the northwest of Argentina. All the living samples of *S. megistacrolobum*, collected by the author in Bolivia have $2n=2x=24$ chromosomes.

The few remaining Bolivian species not included here will be treated in a forthcoming publication.



Solanum leptophyes Bitt. (Ochoa 11888)
near x 1/2

LITERATURE REFERENCES

- BITTER, G. 1912-1913. Solana nova vel minus cognita. Repert. Spec., Novarum Regni Veg. 10:536; 11:18, 381-385, 389-391, 392-393, 393-394; 12:5-6, 152, 448-449, 453-454.
- BERTHAULT, P. 1911. Recherches botaniques sur les varietes cultivees du *Solanum tuberosum* et les especes sauvages de *Solanum* tuberiferes voisins. Ann. Sci. Agron. et Etrang. (Paris), ser. 3, 6 (2):184, 185, 190.
- BRUCHER, H. 1957-1959. Kritische Betrachtungen zur Nomenklatur argentinischer Wildkartoffeln. I. Die Serie Commersoniana. Der Zuchter 26:97-106. 1956; III. Die Serie Cuneoalata. Der Zuchter 27: 77-80. 1957; IV. Die Serie Tuberosa. Der Zuchter 27: 353-357. 1957; V. Die Serie Acaulia. Der Zuchter 29:149-156. VI. Die Serie Alticola (=Megistacroloba). Der Zuchter 29:257-262.
- BUKASOV, S.M. 1933. The potatoes of South America and their breeding possibilities. Lenin Acad. Agr. Sci., U.S.S.R. Inst. Pl. Ind. (Suppl. 58 to Bull. Appl. Bot., Genet., & Pl. Breed. Leningrad). 192 pp. (in Russian, English summary).
- BUKASOV, S.M. 1937. Theoretical Bases of Plant Breeding (in N.I. Vavilov) 3:1-76.
- BUKASOV, S.M. 1959. In Bukasov, S.M., and Kameraz, A.Y. Bases of Potato Breeding. Leningrad.
- CARDENAS, M. 1944. Enumeracion de las papas silvestres de Bolivia. Rev. Agr. Cochabamba 2(2):27-37.

- CARDENAS, M. 1956. New species of *Solanum* (TUBERIUM-HYPERBASARTHURUM) from Bolivia. Bol. Soc. Peruana Bot. 5:9-45.
- CARDENAS, M. 1968. A new species of wild potato from Cochabamba. Rev. Agricultura, Cochabamba 11: 13-14.
- CARDENAS, M. & HAWKES, J.G. 1945. New and little-known wild potato species from Bolivia and Peru. Jour. Linn. Soc., Bot. 53:91-108.
- CORRELL, D.S. 1962. The potato and its wild relatives. Texas Res. Found. Contrib., 4. 606 pp.
- DE CANDOLLE, A. 1852. Prodrumus. 13, I. Paris.
- HAWKES, J.G. 1944. Potato collecting expeditions in Mexico and South America. II. Systematic classification of the collections. Bull. Imp. Bur. Plant Breed. & Genet., Cambridge, 142 pp.
- HAWKES, J.G. 1956. Taxonomic studies on the tuber-bearing *Solanums*. I. *Solanum tuberosum* and the tetraploid species complex. Proc. Linn. Soc. Lond. 166:97-144.
- HAWKES, J.G. 1963. A revision of the tuber-bearing *Solanums* (2nd Ed.). Scot. Pl. Breed. Sta. Rec. 76-181.
- HAWKES, J.G. & HJERTING, J.P. 1969. The potatoes of Argentina, Brazil, Paraguay and Uruguay. Oxford University Press. 259 pp.
- OCHOA, C. 1962. Los *Solanum* tuberiferos silvestres del Peru. Lima, Peru. 297 pp.

- OCHOA, C. 1979. Exploracion colectora de papas silvestres en Bolivia. Biota 11(91):324:330. Illust. Map.
- OCHOA, C. 1980. New taxa of *Solanum* from Peru and Bolivia. Phytologia 46:223-225.
- OCHOA, C. 1980. A new tuber-bearing *Solanum* potentially useful for breeding for aphid resistance. Am. Pot. Journal 57:387-390.
- OCHOA, C. 1981. Two new tuber-bearing *Solanum* from South America. Phytologia 48:229-232.
- OCHOA, C. 1982. A new variety of the Bolivian tuber-bearing *Solanum capsicibaccatum*. Phytologia 50: 181-182.

Harold N. Moldenke

CITHAREXYLUM CALVUM Mold., sp. nov.

Frutex ramis ramulisque gracillimis glabris longitudinaliter striatis angulatisque nigrescentibus, foliis ovatis vel lanceolato-ovatis chartaceis viridulus 4--7 cm. longis 2--4.5 cm. latis utrinque glabris apicaliter acutis vel breviter acuminatis marginaliter integris basaliter acutis vel rotundatis, inflorescentiis terminalibus solitariis simplicibus brevibus 4--7 cm. longis submultifloris, pedunculis rhachideque gracillimis viridibus, calyce obconico ca. 5 mm. longo apicaliter 3 mm. lato glabro margine breviter 5-lobato lobis obtusis, corolla alba tubo 5 mm. longo lobis patentibus 1--1.5 mm. longis extus minutissime puberulis.

Shrub; branches and branchlets apparently very slender, glabrous, longitudinally angular-striate and ridged, nigrescent in drying; petioles slender, about 5 mm. long, subglabrous; leaf-blades chartaceous, rather uniformly bright-green on both surfaces, ovate or lanceolate-ovate, 4--7 cm. long, 2--4.5 cm. wide, apically acute or short-acuminate, marginally entire, basally acute or rounded, very glabrous on both surfaces; inflorescence racemiform, terminal, solitary, simple, relatively many-flowered, 4--7 cm. long, the short peduncles and rachis very slender, green, very minutely and microscopically puberulous; calyx in anthesis obconic, about 5 mm. long, apically 3 mm. wide, externally glabrous, the rim plainly and regularly 5-lobed, the lobes short and apically obtuse; corolla white, its tube equaling or very slightly exerted from the calyx, the lobes spreading, apically rounded, externally very minutely puberulous.

The species is based on *M. Sousa & E. Cabrera* 12309 from 7 km. north of Puerto Morelos, Quintana Roo, Mexico, collected on May 1, 1982, and deposited in the Lundell Herbarium at the University of Texas.

CITHAREXYLUM DONNELL-SMITHII var. *PUBESCENS* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus densissime puberulentis recedit.

This variety differs from the typical form of the species in having its leaf-blades very densely puberulent beneath.

The variety is based on *L. Alfredo Pérez J.* 1125 from a low deciduous forest at Estación de Biología de Chamela, Jalisco, Mexico, collected on March 30, 1975, and deposited in the Lundell Herbarium at the University of Texas. The collector describes the plant as a tree, 7 m. tall, the bark yellowish gray-brown, separating in longitudinal scaly strips.

CITHAREXYLUM HEXANGULARE f. *PARVIFOLIUM* Mold., f. nov.

Haec forma a forma typica speciei foliis maturis 2.5--8 cm. longis 0.8--1.4 cm latis recedit.

This form differs from the typical form of the species in having its apparently mature leaves much smaller, only 2.5--8 cm. long and 0.8--1.4 cm. wide.

The type of the form was collected by Tom Wendt and A. Villalobos C. (no. 3465) on the banks of a river with potrero and acahual in the evergreen forest zone at Panga del Río Corte, 18 km. east of Boca del Monte, in the municipality of Matías Romero, Oaxaca, Mexico, at 70 m. altitude, lat. 17°05' N/. long. 94°53' 45" W., on November 25, 1981, and is deposited in the Lundell Herbarium at the University of Texas. The collectors describe the plant as a shrub, 2--3 m. tall, the flowers fragrant, and the corollas white.

GMELINA ASIATICA f. *PARVIFOLIA* (Roxb.) Mold., stat. nov.

Gmelina parvifolia Roxb., Pl. Coast. Coromand. 2: 32, pl. 162, 1798.

GMELINA ASIATICA f. *INERMIS* (Wight) Mold., stat. nov.

Gmelina inermis Wight ex Wall., Numer. List 87, no. 1816d, hyponym. 1831. Ramis ramulisque semper inermibus.

LANTANA OVATA var. *PUBESCENS* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus densissime pubescentibus recedit.

This variety differs from the typical form of the species in having the lower surface of its leaf-blades very densely pubescent.

The type of the variety was collected by D. C. Daly, M. J. G. Hopkins, L. E. Forero, S. Beck, W. Hernández, H. Phipps III, and H. Wolf (no. 2121) occasional in disturbed semi-deciduous forest on a gentle slope at Serranía de Santiago, 2 km. east of the town of Santiago de Chiquitos, in the province of Chiquitos, Santa Cruz, Bolivia, on July 19, 1983, and is deposited in the Lundell Herbarium at the University of Texas. The collectors describe the plant as a little-branched subshrub, 50 cm. tall, growing in clumps, the corollas lilac with yellow centers.

LIPPIA ELEGANS var. *MACROPHYLLA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum superioribus usque ad 9.5 cm. longis 5.5 cm. latis recedit.

This variety differs from the typical form of the species in its much larger upper leaves at and just below the inflorescences, these having blades to 9.5 cm. long and 5.5 cm. wide.

The type of the variety was collected by B. A. S. Pereira and R. C. Mendonça (no. 408) in the vicinity of Cachoeira do Pipiripau, Distrito Federal, Brazil, on March 16, 1983, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as an "Arbusto delgado, ca. 1.8 m.

altura, folhas muita aromáticas, flores alvas, também aromáticas" and encountered it in a mata ciliar at 800 m. altitude "apos a ponte sobre o rio Pipiripau".

LIPPIA GRISEA var. *LATIFOLIA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum subrotundo-subobovatis usque ad 4 cm. latis recedit.

This variety differs from the typical form of the species in it broader leaf-blades, which are subrotund-subobovate and up to 4 cm. wide.

The type of the variety was collected by E. P. Héninger, T. S. Filgueiras, B. C. Mendonça, and B. A. S. Pereira (no. 7050) at Bacia do Rio São Bartolomeu, Distrito Federal, Brazil, on June 15, 1981, and deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as "Subarbusto ca. 0.5 m. de altura, folhas e ramos com pubescencia branca, flores roseo claro ou brancas" and found it growing on "campo sobre morro cascalhento".

LIPPIA MCVAUGHII var. *LATIFOLIA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum maturis 4--6 cm. longis 2.5--4 cm. latis recedit.

This variety differs from the typical form of the species in having its mature leaf-blades ovate, 4--6 cm. long, and 2.5--4 cm. wide.

The variety is based on *L. Alfredo Pérez 389* from a low deciduous forest with legumes and cacti 2 miles from La Pintada, Jalisco, Mexico, collected on December 13, 1970, and deposited in the Lundell Herbarium at the University of Texas. The collector describes the plant as a tree, 5 m. tall, the corollas greenish-yellow.

SYNGONANTHUS DENSIFLORUS var. *BREVIPIES* Mold., var. nov.

Haec varietas a forma typica speciei caule erecto brevissimo recedit.

This variety differs from the typical form of the species in having its erect above-ground stem very short, almost indiscernible in the densely clustered basal leaves.

The variety is based on Héninger, Filgueiras, Mendonça, & Pereira 7488 from "barra do correço", Cabeça do Veado, Lago Sul, Distrito Federal, Brazil, collected on August 12, 1982, and deposited in the Britton Herbarium at the New York Botanical Garden. The collectors refer to the plant as frequent in wet soil of brejo, the inflorescence white.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XCV

Harold N. Moldenke

PAEPALANTHUS POLYCLADUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 54: 459. 1983.

Emended synonymy: *Paepalanthus polyclados* Alv. Silv., *Fl. Mont.* 1: pl. 123. 1928.

PAEPALANTHUS POLYTRICHOIDES Kunth

Additional bibliography: Mold., *Phytologia* 54: 452 & 459. 1983.

The *Schultes & Cabrera 19129 & 19185* previously cited by me as representing *P. polytrichoides*, actually prove to be *P. pauperimus* Herzog.

Additional citations: VENEZUELA: Amazonas: *Steyermark, Maas, Field, & Redmond 123630* (Lc). Bolivar: *W. W. Thomas 2513* (N). BRAZIL: Amapá: *Egler 47239* (W--2435318). Amazônas: *A. Janssen 458* (Ld). Para: *Daly, Callejas, Silva, Taylor, Rosário, & Santos 1064* (Ld); *Davidse, Rosa, Rosário, & Silva 17871* (Ld, N); *Martinielli 6913* [R. B. Herb. 202833] (Ld); *Plowman, Rosa, & Rosário 9627* (Ld, N, W--2967826); *Prance, Pennington, & Murça Pires 1282* (W--2514753); *Rosa & Santos 1881* (N, N, N).

PAEPALANTHUS POLYTRICHOIDES var. *DENSUS* Mold.

Additional bibliography: Mold., *Phytologia* 33: 56--57. 1976; Øllgaard & Balslev, *Rep. Bot. Inst. Univ. Aarhus* 4: 97. 1980; Mold., *Phytol. Mem.* 2: 110, 129, & 617. 1980.

It seems most probable to me that this taxon should be raised to specific rank. Recent collectors have found it forming firm cushions in wet places on grass paramos with large sloping bog v toward the lakes, up to 3 m. tall scrub in protected places, at 3350--3450 m. altitude, flowering in September.

Additional citations: COLOMBIA: Cundinamarca: *Cleef 3577* (W--2850661); *Cleef & Jaramillo-Mejía 50* (W--2850665); *Cuatrecasas & Jaramillo 25737* (W--2342297--isotype). ECUADOR: Loja: Øllgaard & Balslev 9717 (Ac, E--2773078, Ld, N, N).

PAEPALANTHUS POLYTRICHOIDES var. *GLABER* Mold.

Synonymy: *Paepalanthus polytrichoides* var. *glabra* Mold., *Phytologia* 54: 243, in syn. 1983.

Additional bibliography: Mold., *Phytologia* 42: 31. 1979; Mold., *Phytol. Mem.* 2: 110, 117, 122, 157, & 617. 1980; Mold., *Phytologia* 54: 235, 237, & 243. 1983.

Recent collectors refer to this plant as an herb, 5 cm. tall, with white inflorescences, and report it from white-sand savannas with open bare-ground areas and "abundant" or "ubiquitous in white-sand campinas", in both flower and fruit in June, September, and November. The *Prance & al. 6017* collection, cited below, is a mixture with *Cyperus* sp. The *Janssen 275*, distributed as *P.*

polytrichoides var. *glaber*, actually is *Syngonanthus caulescens* (Poir.) Ruhl.

Additional citations: VENEZUELA: Amazonas: Maguire, Wurdack, & Bunting 37641 (W--2169002). Bolivar: Maguire, Steyermark, & Maguire 53599 (W--2514910). GUYANA: R. S. Cowan 39283 (W--2168847). SURINAM: W. W. Thomas 2382 (Ld). BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2582 (Ld, W--2931236); Prance, Coêlho, Maas, & Pinheiro 11662 (W--2801672), 11667 (W--2801676); Prance, Philcox, Rodrigues, Ramos, & Farias 5145 (W--2573077A); Prance, Ramos, Farias, Paula, & Albuquerque 10420 (W--2573052A); Prance, Ramos, Farias, & Philcox 4833 (W--2573084A), 4836 (W--2573081A). Pará: Daly, Campbell, Silva, Silva, Bahia, & Santos D.808 (N). Roraima: Prance, Forero, Wrigley, Ramos, & Farias 6017 in part (W--2573059A).

PAEPALANTHUS POLYTRICHOIDES f. *VILLOSUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 52. 1977; Mold., *Phytol. Mem.* 2: 124, 157, & 617. 1980.

Additional citations: BRAZIL: Amapá: Black 49-8245 (W--2252936).

PAEPALANTHUS PRAEDENSATUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 30: 320. 1975; Mold., *Phytol. Mem.* 2: 157, 424, & 617. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 120--121, pl. 75 II. 1928 (Ld, N, W).

PAEPALANTHUS PRAEMORSUS Ruhl.

Additional bibliography: Mold., *Phytologia* 30: 320--321 (1975) and 35: 114. 1977; Mold., *Phytol. Mem.* 2: 157, 426, & 617. 1980.

PAEPALANTHUS PRUINOSUS Ruhl.

Additional bibliography: Mold., *Phytologia* 30: 321. 1975; Mold., *Phytol. Mem.* 2: 157 & 617. 1980.

PAEPALANTHUS PSEUDOELONGATUS Ruhl.

Additional bibliography: Mold., *Phytologia* 30: 321--322. 1975; Mold., *Phytol. Mem.* 2: 157 & 617. 1980.

PAEPALANTHUS PSEUDOTORTILIS Ruhl.

Additional bibliography: Mold., *Phytologia* 35: 30 (1976) and 35: 359. 1977; Mold., *Phytol. Mem.* 2: 157 & 617. 1980.

PAEPALANTHUS PUBESCENS Körn.

Additional bibliography: Mold., *Phytologia* 30: 322--323. 1975; Mold., *Phytol. Mem.* 2: 157 & 617. 1980.

PAEPALANTHUS PUBESCENS var. *CHAPADENSIS* Ruhl.

Additional bibliography: Mold., *Phytologia* 30: 323--324. 1975; Mold., *Phytol. Mem.* 2: 157 & 617. 1980.

PAEPALANTHUS PUBESCENS var. *LONGEPILOSUS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 30: 324. 1975; Mold.,

Phytol. Mem. 2: 157 & 617. 1980.

Additional citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 56. 1928 (Ld, N, W).

PAEPALANTHUS PULCHELLUS Herzog

Additional bibliography: Mold., Phytologia 30: 324--325. 1975; Mold., Phytol. Mem. 2: 158 & 617. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980; Mold., Phytologia 51: 244--245. 1982.

Recent collectors describe this plant as having dull-green leaves and brown involucre bractlets under white florets. They have encountered it on bare stony ground subject to periodic flooding in a region of "sandstone, metamorphic and quartzite rock outcrops with associated marsh, damp flushes, and grassland, some cutover mixed deciduous woodland by streams and cerrado", as well as on natural campo, in restinga, and "locally common" in moist depressions of campo rupestre, at 1500--1600 m. altitude, in both flower and fruit in March, June, and August. The Mori & al. 11924 collection, cited below, was photographed in situ by the collectors.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos & Pinheiro in Harley 19643 (Ld, N, W--2936308); Mori & Dom 14348 (Ld, N); Mori, Carvalho, Mattos Silva, Santos, & Ribeiro 11924 (Ld), 11937 (Ld, N).

PAEPALANTHUS PULCHELLUS var. *PUBERULENTUS* Mold., Phytologia 51: 244--245. 1982.

Bibliography: Mold., Phytologia 51: 244--245 (1982) and 52: 122. 1982.

Citations: BRAZIL: Goias: Hatschbach 43162 (Ld--type, W--2931979--isotype).

PAEPALANTHUS PULLUS Körn.

Additional bibliography: Mold., Phytologia 42: 31--32. 1979; Mold., Phytol. Mem. 2: 158 & 617. 1980; Mold., Phytologia 54: 237. 1983.

Additional citations: BRAZIL: Para: Secco 224 (Ld).

PAEPALANTHUS PULLUS var. *FLAVIDUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 325--327. 1975; Mold., Phytol. Mem. 2: 158 & 617. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 56. 1928 (Ld, N, W).

PAEPALANTHUS PULLUS var. *LATIFOLIUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 326 & 327. 1975; Mold., Phytol. Mem. 2: 158 & 617. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 56. 1928 (Ld, N, W).

PAEPALANTHUS PULLUS var. *LONGEPILOSUS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 30: 326—327. 1975; Mold., *Phytol. Mem.* 2: 158 & 617. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 56. 1928 (Ld, N, W).

PAEPALANTHUS PULLUS var. *RAMOSUS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 30: 327. 1975; Mold., *Phytol. Mem.* 2: 158 & 617. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 56. 1928 (Ld, N, W).

PAEPALANTHUS PULVINATUS N. E. Br.

Additional bibliography: Mold., *Phytologia* 42: 32. 1979; Mold., *Phytol. Mem.* 2: 208 & 618. 1980.

PAEPALANTHUS PUNGENS Griseb.

Additional bibliography: Mold., *Phytologia* 37: 52. 1977; Mold., *Phytol. Mem.* 2: 90 & 618. 1980.

Additional citations: CUBA: Oriente: C. Wright 3233 (E--2058232—isotype).

PAEPALANTHUS PUNGENS var. *BREVIFOLIUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 52. 1977; Mold., *Phytol. Mem.* 2: 90 & 618. 1980.

PAEPALANTHUS RAMOSISSIMUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 30: 328—329. 1975; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 209—210, pl. 138. 1928 (Ld, N, W).

PAEPALANTHUS RAMOSUS (Wikstr.) Kunth

Additional bibliography: Mold., *Phytologia* 42: 32. 1979; Mold., *Phytol. Mem.* 2: 158, 369, 397, 398, 400, 402, 404, 424, 427, & 618. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 75. 1980.

Recent collectors have encountered this plant in sandy soil of restingas, campos, and campo rupestre, mostly in wet spots, at 1050 m. altitude, describing the flowers as white in May.

Material has been misidentified and distributed in some herbaria as *P. synchnophyllus* Ruhl.

Additional citations: BRAZIL: Bahia: Carvalho, Mori, & Boom 713 (N); Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18085 (Ld, N); Lanna 754 [Castellanos 25504] (Fe--6047); Mori, Mattos Silva, Kallunki, Santos, & Pereira dos Santos 9682 (N); Minas Gerais: Hatschbach 42873 (Ld). Rio de Janeiro: Araujo 1788 (Fe--13246); Freire V.66 [Silva 66; Herb. FEEMA 18589] (Ld); Lira 201 [Rocha 139; Herb. FEEMA 17469] (Ld); Maas & Carauta 3142 (Ld); Silva & Alves 63 [Herb. FEEMA 18364] (Ld); Sucre, Graziela, & Ichaso s.n. [Herb. Jard. Bot. Rio Jan. 175198] (W--2928658); Viana 552 [Herb. Jard. Bot. Rio Jan. 162079] (W--

2928657). MOUNTED ILLUSTRATIONS: Schnitzl., Icon. 1: 46, fig. 4. 1845 (Ba--381099).

PAEPALANTHUS RAMOSUS var. *AFFINIS* (Bong.) Ruhl.

Additional bibliography: Mold., Phytologia 42: 32. 1979; Mold., Phytol. Mem. 2: 158, 369, 397, 400, 404, 424, & 618. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980.

Recent collectors describe this plant as a wiry, erect, branched herb or subshrub or as a "rosette plant with rather woody stems", 20--80 cm. tall, "with monocarpic basal rosettes and monocarpic shoots", with a stout base, the stems branched, erect, flowering, the leaves rather bright-green or mid-green, the flowering stems woody, the involucre bractlets brown or dark-brown, and the flower-heads and florets white or cream-color. They have found it growing on damp sand in open restinga in a region of "mixed restinga with high forest, bushy areas, damp open ground, and marshes", on stony ground in damp grassland in regions of "sandstone, metamorphic and quartzite rock outcrops with associated marsh, damp flushes and grassland and some cutover mixed deciduous woodland by streams and cerrado", in dry places and sandy soil on campos, and in an area of "sandstone rocks and open scrub on rocky hillsides", from sealevel to 1600 m. altitude, in flower in February, March, and May to July, and in fruit in February and May. Mori and his associates refer to it as "common on campo rupestre".

The Clausen 3, cited below, was previously cited as typical *P. ramosus* (Wikstr.) Kunth.

Additional citations: BRAZIL: Bahia: Carvalho, Mori, & Boom 713 (Ld); Hage & Santos 848 (Ld); Harley, Mayo, Storr, Santos, & Pinheiro in Harley 17999 (Ld, N), 18755 (Ld, N), 19605 (Ld, N), 19781 (Ld, N); Lanna Sobrinho 1437 [Herb. Brad. 60604] (Eu--37659); Mori, King, Santos, & Hage 12519 (Ld, W--2854271); Mori, Walther, & Necker 12792 (Ld, N). Minas Gerais: P. Clausen 3 (Br, Br, Ml, Mu, N, Qu). MOUNTED CLIPPINGS: Kunth, Enum. Pl. 3: 572. 1841 (W).

PAEPALANTHUS REFLEXUS Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 334--335. 1975; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 157-158, pl. 99. 1928 (Ld, N, W).

PAEPALANTHUS REFRACTIFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 57--58. 1976; Mold., Phytol. Mem. 2: 158 & 618. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980.

Recent collectors describe this plant as an erect herb, to 40 cm. tall, the involucre bractlets brown, and the florets white. They have found it growing among long grass in marshes in a region of "sandstone, conglomerate, metamorphic and quartzite rock outcrops with associated scrubby vegetation with damp flushes, grassland and marsh in some areas", at 1600--1850 m. altitude, flowering and fruiting in March.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19724 (Ld, N, W--2936317); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15473 (W--2771330). MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 171--172, pl. 110. 1928 (Ld, N, W).

PAEPALANTHUS REGALIS Mart.

Additional bibliography: Mold., Phytologia 42: 32. 1979; Mold., Phytol. Mem. 2: 158, 427, & 618. 1980.

Recent collectors have encountered this plant in campo rupestre on exposed slopes, at 1000 m. altitude. in both flower and fruit in June.

Additional citations: BRAZIL: Bahia: Mori & Boom 14447 (Ld, N). Minas Gerais: Maguire, Mendes Magalhães, & Maguire 49265 (W--2435326).

PAEPALANTHUS REGALIS var. *RECURVUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 336. 1975; Mold., Phytol. Mem. 2: 158, 427, & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 55, pl. 31 & 32. 1928 (Ld, N, W).

PAEPALANTHUS REGELIANUS Körn.

Additional bibliography: Mold., Phytologia 30: 336--337. 1975; Mold., Phytol. Mem. 2: 158 & 618. 1980.

PAEPALANTHUS REPENS (Lam.) Körn.

Additional & emended bibliography: Bong., Mem. Acad. Sci. St. Petersb., ser. 6, 1: 623--624, pl. 7. 1831; Fedde & Schust., Justs Bot. Jahresber. 40 (2): 15. 1914; Mold., Phytologia 42: 32. 1979; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 44. 1979; Mold., Phytol. Mem. 2: 96, 425, 428, & 618. 1980.

Bongard (1831) lists this species from the Serra da Piedade in Brazil, but this must surely be a misidentification. He himself expresses a question about the determination, noting "Propter nimis brevem cel. Lamarckii descriptionem difficiliter determinanda species. Nostra planta bene convenit et cum icone et cum descriptione citata, sed recedit pedunculis et vaginis brevioribus. Priores in specimine Lamarckiano dicuntur 5--6 pollicares et vagina pollicem longa; haec organa autem dimidium breviora in speciminibus Brasiliensibus." Steudel (1855) ascribes it to "Ins. Borbonia" [=Mauritius].

Additional citations: HISPANIOLA: Dominican Republic: Eggers 2216 (W--937200); A. H. Liegier 13144 (W--2801675); Türckheim 3327 (E--2058756, Ld--photo, W--695701). MOUNTED ILLUSTRATIONS & CLIPPINGS: Lam., Encycl. Meth. Bot. 1: pl. 50, fig. 2. 1791 (Ld); Mold., N. Am. Fl. 19: 42. 1937 (W); Ruhl. in Urb., Symb. Antill. 7: 173. 1912 (W).

PAEPALANTHUS RESTINGENSIS Mold.

Additional bibliography: Mold., Phytologia 30: 339. 1975; Mold., Phytol. Mem. 2: 158 & 618. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980.

Recent collectors have encountered this plant on sandy campo with restinga, on exposed coastal dunes, and in "open areas on usually wet white sand" in a region of "mixed restinga vegetation on sand, with high forest, low trees and shrubs, and sedge meadows [brejo] with open wet areas on white sand", from sealevel to 50 m. altitude, flowering and fruiting in February and April.

Additional citations: BRAZIL: Bahia: Carvalho & Lewis 1097 (Ld); Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18527 (Ld, N, W--2936329).

PAEPALANTHUS RETUSUS C. Wright

Additional bibliography: Mold., Phytologia 37: 53. 1977; Mold., Phytol. Mem. 2: 90, 427, & 618. 1980.

Additional citations: CUBA: Pinar del Rio: Ekman 12806 (E--1006766); C. Wright 3744 (W--46430--isotype).

PAEPALANTHUS RHIZOCEPHALUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 58. 1976; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Additional citations: BRAZIL: Goiás: W. R. Anderson 8188 (W--2755389). MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 126--127, pl. 78. 1928 (Ld, N, W).

PAEPALANTHUS RHIZOMATOSUS Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 340--341. 1975; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 148--149, pl. 92. 1928 (Ld, N, W).

PAEPALANTHUS RIEDELIANUS (Bong.) Körn.

Additional synonymy: *Paepalanthus riedelianus* (Bong.) Ruhl. ex Mold., Phytologia 54: 243 in syn. 1983.

Additional bibliography: Mold., Phytologia 30: 341--342. 1975; C. D. Cook in Heywood, Flow. Pl. World 281, fig. 3. 1978; Mold., Phytol. Mem. 2: 158 & 618. 1980; Mold., Phytologia 54: 243. 1983.

Additional illustrations: C. D. Cook in Heywood, Flow. Pl. World 281, fig. 3. 1978.

Additional citations: MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 30. 1831 (N, W); Kunth, Enum. Pl. 3: 500--501 & 575. 1841 (N, W).

PAEPALANTHUS RIGIDIFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 30: 342--343. 1975; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 66--67, pl. 38. 1928 (Ld, N, W).

PAEPALANTHUS RIGIDULUS Mart.

Additional bibliography: Mold., *Phytologia* 33: 130 & 187 (1976) and 35: 263 & 279. 1977; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Additional citations: MOUNTED CLIPPINGS: Kunth, *Enum. Pl.* 3: 510 (N, W).

PAEPALANTHUS RIGIDUS (Bong.) Kunth

Additional synonymy: *Paepalanthus rigidus* (Bong.) Ruhl. ex Mold., *Phytologia* 54: 243 in syn. 1983.

Additional & emended bibliography: Bong., *Mem. Acad. Imp. Sci. St. Pétersb.*, ser. 6, 1: 621--622. 1831; Mold., *Phytologia* 33: 130--131 & 191. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980; Mold., *Phytologia* 54: 243. 1983.

Additional citations: MOUNTED CLIPPINGS: Bong., *Ess. Monog. Erioc.* 21--22. 1831 (N, W).

PAEPALANTHUS RIPARIUS Mold.

Additional bibliography: Mold., *Phytologia* 37: 53. 1977; Mold., *Phytol. Mem.* 2: 90 & 618. 1980.

Additional citations: MOUNTED CLIPPINGS: Mold., *N. Am. Fl.* 19: 42--43. 1937 (N, W).

PAEPALANTHUS ROBUSTUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 132 & 191. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 20532 (W--2598440). MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Serr. Min.* 53. 1928 (W); Alv. Silv., *Fl. Mont.* 1: 194--195, pl. 128. 1928 (Ld, N, W).

PAEPALANTHUS RORAIMENSIS Mold.

Additional bibliography: Mold., *Phytologia* 33: 132--133. 1976; Mold., *Phytol. Mem.* 2: 118, 122, & 618. 1980; Mold., *Phytologia* 50: 245. 1982.

Recent collectors refer to this plant as an herb to 50 cm. tall, with grayish-white inflorescence heads, locally frequent at the edges of morichal, in both flower and fruit in February and June.

Additional citations: VENEZUELA: Amazonas: C. Huber 3840 (Ld). Bolívar: B. Maguire 33383 (W--2168908); Steyermark, Brewer-Carias, & Liesner 124310 (N).

PAEPALANTHUS RUFESCENS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 133. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 104--106, pl. 57 (2) & 65. 1928 (Ld, N, W).

PAEPALANTHUS RUFICEPS Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 133--134. 1976; Mold., *Phytol. Mem.* 2: 158, 427, & 618. 1980.

PAEPALANTHUS RUFO-ALBUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 134. 1976; Mold.,

Phytol. Mem. 2: 158 & 618. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 94--96, pl. 60 & 61. 1928 (Ld, N, W).

PAEPALANTHUS SALTICOLA Herzog

Additional bibliography: Mold., Phytologia 33: 134--135 (1976) and 35: 120. 1977; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Recent collectors describe this species as an herb, 15 cm. tall, the leaves mid-green, and the heads ashen-gray. They have found it growing in sandy clay soil and in open scrub on white sand with damp areas and extensive sedge meadows (brejo) partly burned over and forming "uma densa almofada em lugar úmido" in restinga and natural campo, at 950 m. altitude, in flower in June and in both flower and fruit in February.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18843a (N); Mattos Silva & Brito 899 (Ld); Mori, Carvalho, Mattos Silva, Santos, & Ribeiro 11977 (Ld, N).

PAEPALANTHUS SAVANNARUM (Mold.) Mold., Phytologia 49: 213. 1981.

Synonymy: *Syngonanthus savannarum* Mold., Phytologia 2: 352 & 381, nom. nud. 1947; Mold. in Maguire & al., Bull. Torrey Bot. Club 75: 202. 1948.

Bibliography: Mold., Phytologia 2: 352 & 381. 1947; Mold. in Maguire & al., Bull. Torrey Bot. Club 75: 202. 1948; Mold., Alph. List Cit. 3: 701 & 894 (1949) and 4: 1166. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 67 & 214. 1949; Mold., Phytologia 4: 330. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Mold., Résumé 74, 76, & 493. 1959; Mold., Résumé Suppl. 1: 5. 1959; Hocking, Excerpt. Bot. A.4: 593. 1962; Mold., Fifth Summ. 1: 128 & 131 (1971) and 2: 965. 1971; Mold., Phytologia 33: 51 & 273 (1976) and 38: 35--37. 1977; Mold., Biol. Abstr. 65: 3719. 1978; Mold., Phytol. Mem. 2: 120, 123, & 625. 1980; Mold., Phytologia 49: 293. 1981; Hocking, Excerpt. Bot. A.39: 101. 1982; Mold., Phytologia 50: 245, 246, 264, & 270. 1982.

Recent collectors describe this plant as a small herb forming dense cushions on white sand savannas and have found it growing in open rocky sandstone areas bordering wet savannas, at 1300 m. altitude, in both flower and fruit in November and December.

Additional & emended citations: VENEZUELA: Bolívar: B. Maguire 33729 (W--2168915); J. A. Steyermark 93759 (Ld, W--2584303); Steyermark & Pruski 121064 (Ld). GUYANA: Maas, Westra, & al. 4361 (Ld, N); Maguire, Bagshaw, & Maguire 40763 (W--2169082); Maguire & Fanshawe 23280 (W--1907829--isotype); Maguire, Tillett, & Tillett 43843 (Ba, Ld, N).

PAEPALANTHUS SAVANNARUM var. *GLABRESCENS* (Mold.) Mold., Phytologia 49: 293. 1981.

Synonymy: *Syngonanthus savannarum* var. *glabrescens* Mold. in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 412. 1957. *Syngonanthus savannarum* f. *glabrescens* Mold., Phytologia 38: 36 sphalm. 1977.

Bibliography: Mold. in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 412. 1957; Mold., Résumé 74 & 493. 1959; Mold., Résumé Suppl. 11: 4. 1964; Mold., Fifth Summ. 1: 128 (1971) and 2: 965. 1971; Mold., Phytologia 33: 51 (1976) and 38: 36--37. 1977; Mold., Phytol. Mem. 2: 118 & 120. 1980; Mold., Phytologia 49: 293. 1981; Hocking, Excerpt. Bot. A.39: 101. 1982; Mold., Phytologia 50: 245, 246, 264, & 270. 1982.

Recent collectors describe this plant as growing to 10 cm. tall, with gray inflorescence heads, "formando pequeños cojines en la pared encima del salto", growing as well in white sandy parts of savannas, where it is said to be "frequent", at 100--2000 m. altitude, in both flower and fruit from December to February. Davidse found it on open savannas with *Trachypogon*, *Echinolaena* and *Paspalum* dominant and with a narrow zone of gallery forest along the rivers, the soil with the top 20 cm. sand and organic material mixture, then 1 m. of white sand, below which is yellow sand. His no. 4681, cited blow, was previously incorrectly cited as *P. steyermarkii* Mold.

Additional & emended citations: VENEZUELA: Amazonas: O. Huber 1591 (Ld); Huber & Tillett 2765 (Ld), 2793 (Ld); Wurdack & Ad-derley 42874 (N, S, W--2320883). Bolívar: Davidse 4681 (N); Huber & Steyermark 6940 (Ld); Ruiz-Teran & López-Palacios 11217 Steyermark, Huber, & Carreno E. 128220a (Ld); Steyermark & Wurdack 331 (N, W--2168504, W--2407789), 539 (N--type, W--2168516--isotype).

PAEPALANTHUS SAXATILIS (Bong.) Körn.

Additional synonymy: *Paepalanthus saxatilis* (Bong.) Ruhl. ex Mold., Phytologia 54: 243 in syn. 1983.

Additional bibliography: Mold., Phytologia 33: 135--136 & 188. 1976; Mold., Phytol. Mem. 2: 158 & 618. 1980; Mold., Phytologia 54: 243. 1983.

Additional citations: MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 25. 1831 (N, W).

PAEPALANTHUS SAXICOLA Körn.

Additional bibliography: Mold., Biol. Abstr. 63: 6590. 1977; Mold., Phytologia 37: 53 & 84 (1977) and 42: 32 & 38. 1979; Mold., Phytol. Mem. 2: 110, 118, 158, & 618. 1980; Mold., Phytologia 50: 245 (1982) and 54: 237 & 243. 1983.

Recent collectors refer to this plant as growing 5 cm. tall, and found it in both flower and fruit in September.

Additional citations: VENEZUELA: Amazonas: Huber, Medina, & Clark 5676 (Ld). BRAZIL: Mato Grosso: Maciel, Teixeira, & al. 26 [Herb. FEEMA.23321] (Fe).

PAEPALANTHUS SAXICOLA var. *CONICUS* Mold.

Additional bibliography: Mold., Phytologia 42: 32 & 38. 1979; Mold., Phytol. Mem. 2: 110, 118, & 618. 1980; Mold., Phytologia 50: 245. 1982.

Recent collectors describe this plant as a frequent diminutive

herb with "blanco-plateadas" inflorescence heads, and have found it growing in open wet areas, in shallow depressions in open sandy areas in 2 cm. of standing water on bana (white sand areas with shrubs and small trees), and in wet ground along streams at the base of *Mauritia* palms, at 120--200 m. altitude, in fruit in February and both in flower and fruit in April and August. They report the vernacular name, "yuwije".

Additional citations: COLOMBIA: Guainia: *Liesner & Clark* 9122 (Ld). Vaupés: *Schultes, Baker, & Cabrera* 17987 (W--2198899); *Schultes & Cabrera* 17586 (W--2198889). VENEZUELA: Amazonas: *H. I. Clark* 6638 (N); *O. Huber* 2346 (Ld); *Liesner* 6893 (Ld), 6928 (Ld); *J. A. Steyermark* 57848 (N, W--1901746).

PAEPALANTHUS SAXICOLA var. *PILOSUS* Mold.

Additional bibliography: Mold., Biol. Abstr. 63: 6590. 1977; Mold., Phytologia 37: 53. 1977; Mold., Phytol. Mem. 2: 158 & 618. 1980.

PAEPALANTHUS SCANDENS Ruhl.

Additional synonymy: *Papaelanthus scandens* Ruhl. ex Domin, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 247 sphalm. 1911.

Additional bibliography: Domin, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 247. 1911; Mold., Phytologia 42: 32--33 (1979) and 45: 270. 1980; Mold., Phytol. Mem. 2: 158, 429, & 618. 1980.

Additional citations: BRAZIL: Distrito Federal: *Filgueiras* 894 (W--2941383); *Héringer, Maguire, Murça Pires, Maguire, & Silva* 56190 (W--2514874); *Héringer, Paula, Mendonça, & Salles* 48 (N). Goiás: *Irwin, Harley, & Smith* 32762 (W--2709584); *Irwin, Santos, Souza, & Fonsêca* 24248 (W--2582549A).

PAEPALANTHUS SCANDENS var. *ALMASENSIS* Mold., Phytologia 45: 270. 1980.

Bibliography: Mold., Phytologia 45: 270. 1980; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Mori and his associates refer to this plant as common on campo rupestre, at 1300--1600 m. altitude, and found it in both flower and fruit in July.

Citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley* 19725 (Ld--isotype, N--isotype, Ub--type, W--2936316--isotype); *Mori, King, Santos, & Hage* 12539 (Ld, W--2854275).

PAEPALANTHUS SCHENCKII V. A. Pouls.

Additional bibliography: Mold., Phytologia 35: 31. 1976; Mold., Phytol. Mem. 2: 158, 427, & 618. 1980.

PAEPALANTHUS SCHLIMII Körn.

Additional bibliography: Mold., Phytologia 33: 141--142. 1976; Mold., Phytol. Mem. 2: 110, 118, & 618. 1980.

PAEPALANTHUS SCHOLIOPHYLLUS Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 142. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980; Mold., *Phytologia* 50: 248. 1982.

Mori and Benton found this plant growing on campo rupestre, at 1000--1200 m. altitude, in flower in December.

Additional citations: BRAZIL: Bahia: *Mori* 12896 (Ld, N); *Mori & Benton* 13210 (Ld, N). Goiás: *Glaziou* 22302 [U. S. Nat. Herb. photo 5888] (W--photo).

PAEPALANTHUS SCHOMBURGKII Klotzsch

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 180. 1927; Mold., *Phytologia* 33: 133 & 142--143 (1976) and 37: 258 & 259. 1977; Mold., *Phytol. Mem.* 2: 118, 122, & 618. 1980.

Knuth (1927) cites *ImThurn* 33 and *Schomburgk s.n.* from Roraima, Venezuela.

Additional citations: MOUNTED CLIPPINGS: Klotzsch in Schomb., *Faun. Fl. Brit. Guian.* 1064. 1848 (N, W).

PAEPALANTHUS SCHUECHIANUS Körn.

Additional bibliography: Mold., *Phytologia* 35: 31. 1976; Mold., *Phytol. Mem.* 2: 158, 398, 427, & 618. 1980.

PAEPALANTHUS SCHULTESII Mold.

Additional bibliography: Mold., *Phytologia* 33: 144--145. 1976; Mold., *Phytol. Mem.* 2: 110 & 618. 1980.

Additional citations: COLOMBIA: Cundinamarca: *Killip* 34090 (W--1770936). Norte de Santander: *Fosberg* 19185 (W--2108104).

PAEPALANTHUS SCHWACKEANUS Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 145--146 (1976) and 35: 254. 1977; Mold., *Phytol. Mem.* 2: 158, 427, & 618. 1980.

PAEPALANTHUS SCHWACKEANUS var. *GLABRESCENS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 145--146. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 224. 1928 (Ld, N, W).

PAEPALANTHUS SCIRPEUS Mart.

This taxon is now known as *Blastocaulon scirpeum* (Mart.) Giul., which see.

PAEPALANTHUS SCLERANTHUS Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 147--148. 1976; Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 45, 46, 52, & 57, fig. 45--50. 1979; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 57. 1979. [to be continued]

BOOK REVIEWS

Alma L. Moldenke

"HERBIVORY The Dynamics of Animal-Plant Interactions" by Michael J. Crawley, x + 437 pp., 90 b/w fig. & 16 tab. University of California Press, London, England, Los Angeles & Berkeley, California 94720. 1983. \$45.00.

This Volume 10 in the Studies in Ecology series is an important, well-prepared study coordinating a wealth of material from the invertebrate and vertebrate animal world with the plant world's forests, crops, range and weed growths as well as lab experiments. "It aims to show how plant numbers, sizes, chemical composition and spatial distribution affect the birth, death and dispersal rates of their herbivores, and how the timing, intensity, selectivity and spatial pattern of animal feeding affect the establishment, growth and seed set of plants." There is a particularly well developed chapter on plant-herbivore dynamics that stresses the use of the Lotka-Volterra as the basic population model and a subsequent one on community dynamics. Then there is a well organized chapter of important conclusions such as "animal numbers are not food limited (their populations are determined by natural enemies or by habitat requisites)....and plants do not submit passively to herbivore attack, but respond to feeding by changing their shape, their chemistry, their photosynthetic rate and their physical defences." A very full list of references is provided.

CHALLENGING BIOLOGICAL PROBLEMS - Directions Toward Their Solution" edited by John A. Behnke, xi + 502 pp., 32 b/w fig., 22 tab. & 3 maps. Oxford University Press, Oxford, England & New York, N. Y. 1001. 1972. \$25.00.

This well oriented book is a 25th Anniversary celebration volume for the American Institute of Biological Sciences. Although presented more than a decade ago, it still makes pertinent reading and fortunately is still available. Scientific progress in this interim as that of earlier times, of the present and of the foreseeable future, has and will mean clarifying parts of the bigger problems and exposing new fields for future endeavors. The 21 papers are all written by prominent leaders in their own fields, such as J. Lederberg on Biological Innovation and Genetic Intervention, I. Kupferman on Cellular Mechanisms of Learning, D. Axelrod and P. Raven on Evolutionary Biogeography Viewed from Plate Tectonic Theory, and D. Janzen on Whither Tropical Ecology. It is interesting to note, in line with the recent Nobel Prize awarding, Witt's comment on the "brilliant work of Barbara McClintock (1961) which demonstrates that the impediments can be surmounted."

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. XCVI

Harold N. Moldenke

PAEPALANTHUS SCOPULIFER Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 148. 1976; Mold., *Phytol. Mem.* 2: 158 & 618. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 98--99. 1928 (Id, N, W).

PAEPALANTHUS SCOPULORUM Mold.

Additional bibliography: Mold., *Phytologia* 33: 148--149 (1976) and 35: 120. 1977; Mold., *Phytol. Mem.* 2: 118 & 618. 1980; Mold., *Phytologia* 50: 245 & 246. 1982.

Recent collectors have found this plant growing on open rocky plateaus, in marshes, and "along moist ledges at base of salto", at 640--2420 m. altitude, often "locally frequent", flowering and fruiting in February, August, and October. Tillett and his associates describe it as an herb, the leaves thin, slightly brittle, dark- or mid-green, the "bracts at base of and scapes light-green", the inflorescence bracts brownish or blackish, the flowers white, and have found it "locally abundant in grass on hillsides of sandstone talus in mist from falls covered with dense 1 m. growth of grass, herbs and some low shrubs" and "locally frequent in wet areas, scrub and low (8--10 m.) forest: in Guyana.

Material of this species has been misidentified and distributed in some herbaria as the very similar *P. tatei* Mold. and the Steyermark 75491 collection, cited below, was erroneously so reported by me in a previous publication. Steyermark and his associates say of their nos. 115578 & 115718 "cf. also *P. perplexans* and *P. roraimensis*" which are likewise obviously closely related taxa. The Maguire & al. 31718, cited below, was also previously erroneously regarded by me as *P. tatei*.

Additional citations: VENEZUELA: Amazonas: Maguire, Phelps, Hitchcock, & Budowski 31718 (F, Gl, K, N, Ve, W--2046544); Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115718 (Ld), 115578 (Ld). Bolívar: B. Maguire 33045 (W--2168895); Steyermark 59914 (W--1901801--isotype), 75491 (Ss, W--2407755). GUYANA: Tillett & Tillett 45751 (N); Tillett, Tillett, & Boyan 45071 (N).

PAEPALANTHUS SCOPULORUM var. *AUYANTEPUIENSIS* Mold.

Additional bibliography: Mold., *Phytologia* 33: 149. 1976; Mold., *Phytol. Mem.* 2: 118 & 618. 1980.

Recent collectors describe this plant as having elongated stems, flaccid grass-green leaves, and black involucre, and refer to it as locally frequent at 1895--1910 m. altitude, in flower in February. The Steyermark & Wurdack collection, cited

below, was previously incorrectly identified as *P. tatei* Mold. or as typical *P. scopulorum* Mold.

Additional citations: VENEZUELA: Bolívar: Steyermark & Wurdack 1080 (N, W--2168531).

PAEPALANTHUS SCYTOPHYLLUS Ruhl.

Additional bibliography: Mold., Phytologia 33: 149. 1976; Mold., Phytol. Mem. 2: 158, 427, & 618. 1980.

PAEPALANTHUS SEDOIDES Körn.

Additional bibliography: Mold., Phytologia 33: 149--150. 1976; Mold., Phytol. Mem. 2: 158, 398, & 618. 1980.

PAEPALANTHUS SELLOWIANUS Körn.

Additional bibliography: Mold., Phytologia 42: 33. 1979; Mold., Phytol. Mem. 2: 158, 425, 427, & 618. 1980.

PAEPALANTHUS SENAEANUS Ruhl.

Additional bibliography: Mold., Phytologia 37: 39 & 53. 1977; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Additional citations: BRAZIL: Minas Gerais: A. Silveira 368 [Herb. Marie-Victorin 15832] (Ld--photo). MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Serr. Min. 61--62. 1908 (W); Alv. Silv., Fl. Mont. 1: pl. 169. 1928. (Ld, N, W).

PAEPALANTHUS SERICEUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 152--153. 1976; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 84--85, pl. 50. 1928 (Ld, N, W).

PAEPALANTHUS SERICIFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 153. 1976; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Serr. Min. 56. 1908 (W).

PAEPALANTHUS SERRALAPENSIS Mold.

Additional bibliography: Mold., Phytologia 33: 183. 1976; Angely, S. Am. Bot. Bibl. 2: 669. 1980; Mold., Phytol. Mem. 2: 158 & 618. 1980.

Additional citations: MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 31. 1831 (W); Kunth, Enum. Pl. 3: 576. 1841 (N, W).

PAEPALANTHUS SERRINHENSIS Alv. Sil.

Additional bibliography: Mold., Phytologia 33: 183. 1976; Mold., Phytol. Mem. 2: 158, 427, & 618. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1, 44--46, pl. 23. 1928 (Ld, N, W).

PAEPALANTHUS SESLERIOIDES Griseb.

Additional bibliography: Mold., Phytologia 37: 53--54. 1977;

Mold., Biol. Abstr. 63: 3041. 1977; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytol. Mem. 2: 92, 92, 397, 618, & 619. 1980; Mold., Phytologia 54: 436. 1983.

The Wright collection, cited below, is a mixture with *P. lamarckii* Kunth.

Additional citations: CUBA: Pinar del Río: *C. Wright* 3234 in part (W--46429--isotype).

PAEPALANTHUS SESLERIOIDES var. *CARABIAE* Mold.

Additional bibliography: Mold., Phytologia 37: 54. 1977; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytol. Mem. 2: 92 & 619. 1980.

PAEPALANTHUS SESLERIOIDES var. *WILSONII* Mold.

Additional bibliography: Mold., Phytologia 37: 54. 1977; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytol. Mem. 2: 90, 92, & 619. 1980.

Additional citations: ISLA DE PINOS: *Killip* 45363 (Mi).

PAEPALANTHUS SESSILIFLORUS Mart.

Additional bibliography: Mold., Phytologia 42: 33. 1979; Mold., Phytol. Mem. 2: 118, 159, 403, & 619. 1980.

Recent collectors refer to this plant as a minute heliophile herb, growing in white sand "em restinga arbustiva e aberto" in full exposure to the sun, the flower-heads white, and have found it in anthesis in April and in both flower and fruit in October.

Additional citations: BRAZIL: Amazonas: *Madison, Kennedy, Monteiro, & Braga* 6226 (N). Rio de Janeiro: *Araujo & Maciel* 3030 [Herb. FEEMA 14861] (Ld).

PAEPALANTHUS SESSILIFLORUS var. *VENEZUELENSIS* Mold.

Additional bibliography: Mold., Phytologia 42: 33. 1979; Mold., Phytol. Mem. 2: 118 & 619. 1980.

Additional citations: VENEZUELA: Bolívar: *Steyermark, Steyermark, Wurdack, Wurdack, & Wiehler* 106609 (W--2926075--isotype).

PAEPALANTHUS SESSILIS H. Lecomte

Additional bibliography: Mold., Phytologia 33: 187. 1976; Mold., Phytol. Mem. 2: 217 & 619. 1980.

PAEPALANTHUS SICAEOFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 187 (1976) and 35: 263. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: BRAZIL: Minas Gerais: *Irwin, Santos, Souza, & Fonseca* 22302 (W--2582560A). MOUNTED ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: pl. 148. 1928 (Ld).

PAEPALANTHUS SILVEIRAE Ruhl.

Additional bibliography: Mold., Phytologia 33: 187--188. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

PAEPALANTHUS SIMILIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 188. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 199--200, pl. 131. 1928 (Ld, N, W).

PAEPALANTHUS SINGULARIUS Mold.

Synonymy: *Paepalanthus singularis* Mold., in herb.

Additional bibliography: Mold., *Phytologia* 37: 54. 1977; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

Recent collectors have encountered this plant in "hot open places in white sand with low restinga vegetation surrounded by mata alta on terra firme" and on "campo aberta", in both flower and fruit in June.

Additional citations: BRAZIL: Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22542 (N, W--2935297); Cid, Ramos, & Mota 1217 [Herb. Inst. Nac. Pesq. Amaz. 94436] (Ld, N); Davidson & Martinelli CD.10623 (Ld).

PAEPALANTHUS SPATHULATUS Körn.

Additional bibliography: Mold., *Phytologia* 33: 188--189. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

PAEPALANTHUS SPECIOSUS (Bong.) Körn.

Additional synonymy: *Paepalanthus speciosus* Bong. apud Ruhl. in Wettstein, *Denkschr. K. Akad. Wiss. Wien Math.-Nat.* 79: 87. 1908.

Additional bibliography: Ruhl. in Wettstein, *Denkschr. K. Akad. Wiss. Wien Math.-Nat.* 79: 87. 1908; Latorre, Ortega, & Inca, *Cienc. Naturaleza* 18: 62. 1977; Mold., *Phytologia* 42: 33. 1979; Mold., *Phytol. Mem.* 2: 159, 424, 425, 427, & 619. 1980; Mold., *Phytologia* 52: 414 (1983) and 54: 237. 1983.

Recent collectors have found this plant growing in periodically burned cerrado and in wet clay-sand soil of cerrado in an area of capoeira, in both flower and fruit in August and October. They describe it as an herb, 1--1.5 m. tall, with cream-colored flowers and list the vernacular name "vassourao".

Ruhland (1908) cites and unnumbered Wacket collection from the border of Minas Gerais and São Paulo, Brazil. Latorre and his associates (1977) cites Krukoff 2052 from Amazonian Brazil. They erroneously give "R. Kruk" for B. A. Krukoff and "(Boug.) Koene" for "(Bong.) Körn."

Additional citations: BRAZIL: Distrito Federal: Heringer 17388 (N); Heringer, Paula, Mendonça, & Salles 86 (N). Goiás: W. R. Anderson 6212 (W--2755479). Mato Grosso: Macedo, Duarte, & Antonia 1449 (N); Murça Pires & Santos 16333 (N). MOUNTED CLIPPINGS: Kunth, *Enum. Pl.* 3: 579. 1841 (N, W).

PAEPALANTHUS SPECIOSUS var. *ANGUSTIFOLIUS* Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 54. 1977; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

Recent collectors have encountered this plant in cerrado and cerrado brejoso.

Additional citations: BRAZIL: Distrito Federal: *Héringer* 16876 (N); *Héringer, Figueiras, Mendonça, Pereira, Salles, & Silva* 474 (N).

PAEPALANTHUS SPECIOSUS var. *ATTENUATUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 33. 1979; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

Recent collectors have found this plant in flower in December, growing at 3300 feet altitude.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Paula, Mendonça, & Salles* 483 (N). Goiás: *Maguire, Maguire, & Murça Pires* 44790 (Ld, N).

PAEPALANTHUS SPECIOSUS f. *CALVESESCENS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 33. 1979; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

PAEPALANTHUS SPECIOSUS var. *CHLOROCEPHALUS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 33: 195. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

PAEPALANTHUS SPECIOSUS var. *GLABER* Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 191--197. 1976; Mold., *Phytol. Mem.* 2: 159, 424, 425, & 619. 1980.

Recent collectors refer to this plant as "white-flowered shrublets or woody herbs", 1--1.5 m. tall, and have encountered it in swamps, in cerrado, and on campo rupestre, at 1100 m. altitude, in flower in April and May, and in fruit in May.

Additional citations: BRAZIL: Distrito Federal: *Pereira* 236 (N). Goiás: *W. R. Anderson* 6536 (W--2755480); *Hatschbach* 43081 (Ld, W--2931955); *Ramamoorthy* 521 (E--2904853).

PAEPALANTHUS SPECIOSUS var. *GOYAZENSIS* Mold., *Phytologia* 52: 414. 1983.

Bibliography: Mold., *Phytologia* 52: 414 (1983) and 54: 237. 1983.

Héringer and his associates describe this plant as a subshrub, with white inflorescences, and encountered it on campo rupestre, in flower in May. The Dawson collection, cited below, was previously regarded by me as representing var. *glaber* Ruhl.

Citations: BRAZIL: Distrito Federal: *Héringer, Figueiras, Mendonça, Pereira, Salles, & Silva* 4602 (N). Goiás: *E. Y. Dawson* 14271 (Ld--type).

PAEPALANTHUS SPECIOSUS var. *KOERNICKEI* Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 191 & 197. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

PAEPALANTHUS SPECIOSUS var. *PULVERULENTUS* Mold.

Additional bibliography: Mold., *Phytologia* 33: 192 & 197--198.

1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Recent collectors describe this plant as 60 cm. tall, with white inflorescence heads, and have found it growing on campo cerrado and in cerrado on periodically burned campo, at 180 m. altitude, flowering and fruiting in June.

Additional citations: BRAZIL: Goiás: *Murça Pires & Santos* 16214 (N, N). Pará: *Rosário* 76 (N, N).

PAEPALANTHUS SPHAEROCEPHALUS Ruhl.

Additional bibliography: Mold., Phytologia 33: 198 (1976) and 34: 259. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980.

Recent collectors describe this plant as a heliophytic rosette herb, 10 cm. tall, the flower-heads white. They have encountered it in wet sandy soil, on campo rupestre, and in "marshes in a region of sandstone, conglomerate, metamorphic and quartzite rock outcrops with associated scrubby vegetation with damp flushes and grassland and marsh in some areas", at 1000 m. altitude, flowering and fruiting in March and July.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley* 19667 (Ld, N, W--2936318); *Mori, King, Santos, & Hage* 12399 (Ld, W--2854263), 12407 (Ld, W--2854258). Minas Gerais: *Hatschbach* 41536 (Ld).

PAEPALANTHUS SPHAERULIFER Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 199. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 103--104, pl. 64. 1928 (Ld, N, W).

PAEPALANTHUS SPIRALIFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 199. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 178--179, pl. 115. 1928 (Ld, N, W).

PAEPALANTHUS SPIRIFER Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 199--200. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 195--197, pl. 129. 1928 (Ld, N, W).

PAEPALANTHUS SPIROPHORUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 200. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 175--176, pl. 113. 1928 (Ld, N, W).

PAEPALANTHUS SPIXIANUS Mart.

Additional bibliography: Mold., Phytologia 33: 200--201 (1976) and 35: 262, 263, & 279. 1977; Mold., Phytol. Mem. 2: 159, 401, & 619. 1980.

PAEPALANTHUS SQUAMULIFERUS Mold.

Additional synonymy: *Leiothrix squamuliferus* Mold., Phytol. Mem. 2: 419 in syn. 1980.

Additional bibliography: Mold., Phytologia 33: 201--202 (1976) and 35: 304. 1977; Mold., Phytol. Mem. 2: 118, 419, & 619. 1980.

Additional citations: VENEZUELA: Bolívar: *Steyermark* 59777 (W--1901796--isotype).

PAEPALANTHUS STEGOLEPOIDES Mold.

Additional bibliography: Mold., Phytologia 33: 271. 1976; Mold., Phytol. Mem. 2: 118, 159, & 619. 1980; Mold., Phytologia 50: 245 & 418. 1982.

Recent collectors describe this plant as a frequent herb, to 1.5 m. tall, forming tufts, the light-green leaves spreading-ascending, the inflorescence heads gray-white, and the flowers white. They have found it growing in open boggy savannas and "on open slopes at base of cliffs, at 1500--3000 m. altitude, flowering and fruiting in February, August, and December.

Additional citations: VENEZUELA: Amazonas: *Steyermark*, *Brewer-Carias*, & *Liesner* 124391 (N), 124533 (N). Bolívar: *Moore*, *Am-brose*, *Dietz*, & *Pfister* 9813 (Ba, N); *Steyermark* & *Wurdack* 491 (W--2407721); *Wurdack* 34315 (W--2168927--isotype).

PAEPALANTHUS STEGOLEPOIDES var. *ACUTALIS* Mold.

Additional bibliography: Mold., Phytologia 33: 271. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: BRAZIL: Amazonas: *Maguire*, *Murca Pires*, & *Maguire* 60509 (N--isotype).

PAEPALANTHUS STENOLEPIS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 271. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 43--44, pl. 22. 1928 (Ld, N, W).

PAEPALANTHUS STEPHANOPHORUS Alv. Silv.

Additional bibliography: Mold., Phytologia 33: 271--272. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 40--42, pl. 20. 1928 (Ld, N, W).

PAEPALANTHUS STEREOPHYLLUS Ruhl.

Synonymy: *Paepalanthus stereoshyllus* Ruhl. ex Mold., Phytol. Mem. 2: 619 sphalm. 1980.

Additional bibliography: Mold., Phytologia 33: 272. 1976; Mold., Phytol. Mem. 2: 159, 428, & 619. 1980.

PAEPALANTHUS STEYERMARKII Mold.

Additional bibliography: Mold., Phytologia 42: 33--34. 1979; Mold., Phytol. Mem. 2: 118 & 619. 1980; Mold., Phytologia 55: 53. 1984.

Recent collectors refer to this plant as an herb growing in globose clumps, the leaves pale-green, and the inflorescence heads gray. They have found it growing on dry savannas, at 1400 m. altitude, both in flower and fruit in November.

The *Davidse 4681*, distributed as *P. steyermarkii* and so cited in a previous publication in this series, actually is *P. savanarum* var. *glabrescens* (Mold.) Mold.

Additional citations: VENEZUELA: Bolivar: Maas & Steyermark 5366 (Ut--390372B); B. Maguire 33241 (W--2168904); J. A. Steyermark 59369 (W--1901817--isotype), 111284 (W--2814186); Steyermark & Aristeguieta 64 (W--2430089); Steyermark, Smith, Smith, Dunsterville, & Dunsterville 105473 (W--2925998).

PAEPALANTHUS STRIATUS Ruhl.

Additional bibliography: Mold., *Phytologia* 33: 273 & 274. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

PAEPALANTHUS STRICTUS Körn.

Additional bibliography: Mold., *Phytologia* 33: 274. 1976; Mold., *Phytol. Mem.* 2: 159 & 619. 1980.

Additional citations: BRAZIL: Minas Gerais: Maguire, Mendes Magalhães, & Maguire 49223 (W--2435296).

PAEPALANTHUS STUEBELIANUS Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 34. 1979; Mold., *Phytol. Mem.* 2: 134 & 619. 1980; Mold., *Phytologia* 54: 235. 1983.

Recent collectors describe this plant as forming cushions, with the inflorescences white [or "heads brown", probably in fruit] and report it as "common in sandy soil on sandstone outcrops with sterile white sand overlying black sand, with *Ericaceae*, *Weinmannia*, and *melastomes* abundant", at 2800--2900 m. altitude, in flower and fruit in March, July, and September.

Additional citations: PERU: Amazonas: Boeke 2036 (W--2927523), 2133 (N, N); Hutchison & Wright 5548 (W--2509032); Luteyn & Lebron-Luteyn 5526 (N, W--2915260). Piura: Sagástegui A., López, & Mestacero 10225 (Ld).

PAEPALANTHUS SUBCAULESCENS N. E. Br.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 180--181. 1927; Mold., *Phytologia* 35: 33--34. 1976; Mold., *Biol. Abstr.* 63: 3041. 1977; Mold., *Phytol. Mem.* 2: 118, 122, & 619. 1980.

Knuth (1927) cites Connell & Quelch 300 from Roraima, Venezuela. Actually the first-mentioned of these collectors is F. McConnell.

Additional citations: MOUNTED CLIPPINGS: N. E. Br., *Trans. Linn. Soc. Lond. Bot.*, ser. 2, 6: 71. 1901 (W).

PAEPALANTHUS SUBFALCATUS Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot. A.* 23: 388. 1974; Mold., *Phytologia* 35: 34--35. 1976; Mold., *Biol. Abstr.* 63:

3041. 1977; Mold., Phytol. Mem. 2: 159, 428, & 619. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Santos, Souza, & Fonseca 23355 (W--2582551A).

PAEPALANTHUS SUBFALCATUS var. *VILLOSUS* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 388. 1974; Mold., Phytologia 35: 35. 1976; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonseca, Souza, Santos, & Ramos 28201 (W--2709898-- isotype).

PAEPALANTHUS SUBTILIS Miq.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 181. 1927; Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytologia 42: 31 & 34. 1979; Mold., Phytol. Mem. 2: 118, 122, 124, 159, 428, & 619. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 75. 1980; Mold., Phytologia 50: 245 & 248 (1982) and 54: 80 & 151. 1983.

Recent collectors describe this plant as an herb, 5--10 cm. tall, with gray, grayish-white, or whitish inflorescence heads and have found it growing "locally abundant" in disturbed areas of sandy savannas, in wet sandy soil of laja granítica, in igapo, on open white-sand roadbanks, in areas of "sandstone, metamorphic and quartzite rock outcrops with associated marsh and damp flushes", and on "rocky riversides with rapids, riverine vegetation, cerrado with sandstone outcrops and some grassland areas subject to flooding", at 75--1500 m. altitude, flowering and fruiting in February, March, June, and July. Goodland reports it from "grassland with scattered trees, the dominants being *Curatella*, *Byrsonima*, *Trachypogon*, & *Fimbristylis*". A photograph of the plant in situ is said to accompany Plowman & al. 9560.

The Egler 47650, cited by me in a previous paper as *P. subtilis*, is a mixture of *P. leucocyaneus* var. *egleri* Mold. and *Syngonanthus glandulosus* f. *epapillosus* Mold.

Knuth (1927) cites "Connell" [=McConnell] & Quelch 312 from Roraima and Gaillard 95 from Bolívar, Venezuela.

Material of *P. subtilis* has been misidentified and distributed in some herbaria as *Lachnocaulon* sp. On the other hand, the Steyermark & Pruski 121066, distributed as *P. subtilis*, actually is *P. aristatus* Mold.

Additional citations: VENEZUELA: Amazonas: O. Huber 1085 (Ld), 2144 (Ld), 4652 (Ld), 5601 (Ld), 5621 (Ld); Huber & Tillett 937 (Ld); Molina & Barkley 18V186 (W--1999487). Bolívar: J. A. Steyermark 89700 (W--2486399). GUYANA: Goodland 282 (W--2548120); Maguire & Fanshawe 23000 (W--1907815). SURINAM: Maguire 23984 (W--1907852). BRAZIL: Amapá: Maguire, Murca Pires, & Maguire 47129 (W--2435345). Amazonas: Alencar 43 (Ld, N, W--2932763); Poole 1616 (Ld, N); Prance, Steward, Ramos, Fidalgo, & Prance 20201 (N, W--2935295); Schmidt & Pabst 9684 [Herb. Brad. 70039] (Ld). Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19577 (Ld, N, W--2936333), 20127 (Ld, N). Pará: Plowman,

Rosa, & Rosario 9784 (Ld, N).

PAEPALANTHUS SUBTILIS var. *HIRSUTUS* Ruhl.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 113. 1977; Mold., Phytol. Mem. 2: 124, 159, 428, & 619. 1980; Mold., Phytologia 50: 245. 1982.

Additional citations: VENEZUELA: Amazonas: Huber & Tillett 2851 (Ld).

PAEPALANTHUS SUBTILIS var. *PUBERULUS* Ruhl.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 113--114. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980; Mold., Phytologia 50: 248. 1982.

Plowman and his associates encountered this plant on open white-sand campina and photographed it in situ.

Additional citations: BRAZIL: Pará: Plowman, Rosa, & Rosario 9560 (Ld, N, W--2967824).

PAEPALANTHUS SUCCISUS Mart.

Additional synonymy: *Paepalanthus succisus* "Mart. ex Koern." apud Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 114. 1977; Mold., Phytol. Mem. 2: 159, 428, 619, & 628. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980; Mold., Phytologia 50: 263. 1982.

Recent collectors describe this species as a rosette herb, to 25 cm. tall, the leaves gray-green, the involucre bractlets dark, and the florets white. They have found it growing on campo rupestre and in marshes in a region of "sandstone, metamorphic and quartzite rock outcrops associates with marsh and damp flushes", at 1000--1500 m. altitude, in flower in February and July.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19551 (Ld, N, W--2936326); Mori, King, Santos, & Hage 12404 (Ld, W--2854259).

PAEPALANTHUS SUFFRUTICANS Ruhl.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 114--115. 1977; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 44. 1979; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Recent collectors have encountered this plant at 1500--1700 m. altitude, flowering in November, and refer to it as an herb, 60 cm. tall, with white flowers.

Additional citations: BRAZIL: Minas Gerais: Cruz, Shepherd, & al. 6475 (W--2883679).

PAEPALANTHUS SUFFRUTICANS var. *ANGUSTIFOLIUS* Alv. Silv.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 115. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

PAEPALANTHUS SUPERBUS Ruhl.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 115--116. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: BRAZIL: Minas Gerais: A. Silveira 373 (Ld--photo). MOUNTED ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: pl. 168. 1928 (Ld, N, W).

PAEPALANTHUS SUPINUS Körn.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 116--117. 1977; Mold., Phytol. Mem. 2: 159, 175, & 619. 1980.

Additional citations: BRAZIL: Mato Grosso: W. R. Anderson 9900 (W--2755481). MOUNTED CLIPPINGS: Körn. in Mart., Fl. Bras. 3 (1): 352 & 507. 1863 (N, W).

PAEPALANTHUS SYCHNOPHYLLUS Ruhl.

Additional bibliography: Mold., Phytologia 42: 34. 1979; Mold., Phytol. Mem. 2: 159 & 619. 1980; Mold., Phytologia 55: 47. 1984.

The Sucre & al. 5312 [Herb. Jard. Bot. Rio Jan. 175198], distributed in some herbaria as *P. synchnophyllus*, actually is *P. ramosus* (Wikstr.) Kunth.

PAEPALANTHUS SYNGONANTHOIDES Alv. Silv.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 118--119. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Serr. Min. 67. 1908 (W); Alv. Silv., Fl. Mont. 1: pl. 17 II. 1928 (Ld, N, W).

PAEPALANTHUS TATEI Mold.

Additional bibliography: Mold., Phytologia 42: 34. 1979; Mold., Phytol. Mem. 2: 110, 118, 122, 124, 357, & 619. 1980.

Recent collectors have encountered this plant in rock crevices at the edges of rivers, on forested slopes of sandstone substrate, on moist sandstone slopes, along rivulets on wet sandstone, in sandy soil on shaded wet banks in primary wet forests, at the edges of streams in primary forested areas (the forest evergreen) with soils tending to be sandy and derived from schist or gneiss rock, and "common" in wet dwarf forests, at 600--1310 m. altitude, in flower in July and November, and in both flower and fruit in March. They describe the inflorescence as "grayish" or the "fruiting-heads jet-black".

The Bogner specimen cited below was grown from seeds collected on Mt. Auyantepui, Venezuela.

The Maguire, Phelps, Hitchcock, & Budowski 31718, Steyermark 75491, and Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115718, distributed and/or cited by me previously as *P. tatei*, are now believed, instead, to represent the closely related *P. scopulorum* Mold., while Steyermark & Wurdack 1080 is *P. scopulorum* var. *ayuantepuiensis* Mold.

Additional citations: VENEZUELA: Amazonas: Maguire, Cowan, & Wurdack 29631 (W--2046480); Maguire & Maguire 35020 (W--2168937), 35021 (W--2168938), 35208 (W--2168942); Maguire & Politi 27343 (W--2046426), 27702 (W--2046443). Bolívar: Luteyn, Lebrón-Luteyn, & Steyermark 6262 (N, W--2939058); J. A. Steyermark 75504 (W--2407756), 75998 (W--2407781), 90337 (W--2430216), 93450 (W--2584114); Steyermark & Maas 123730 (Lc); Steyermark & Nilsson 723 (W--2400064); Steyermark & Wurdack 1123 (W--2168532). Táchira: Liesner & González 10336 (Ld); Liesner, González, & Smith 9598 (Ld, N); Steyermark & Liesner 118877 (Ld), 118926 (Ld), 119030 (Ld); Steyermark, Liesner, & Gonzalez 119863 (Ld). GUYANA: Maguire & Fanshawe 32538 (W--2168884). SURINAM: Maguire 24241 (W--1907835), 24670 (W--1907841), 24832 (W--1907845); Maguire, Schulz, Soderstrom, & Holmgren 54203 (W--2514872). CULTIVATED: Germany: Bogner 170/75 (Ld).

PAEPALANTHUS TENUICAULIS Alv. Silv.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 121. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 113--115, pl. 66, fig. 2. 1928 (Ld, N, W).

PAEPALANTHUS TESSMANNII Mold.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 37: 54--55. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

Hatschbach encountered this plant in brejo, in flower in December.

Additional citations: BRAZIL: Paraná: Hatschbach 42658 (Ld); Reitz & Klein 17457 (W--2548328).

PAEPALANTHUS TORTILIS (Bong.) Mart.

Additional synonymy: *Paepalanthus tortilis* (Bong.) "Mart. ex Koern." apud Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980. *Paepalanthus tortilis* (Bong.) Ruhl. ex Mold., Phytologia 54: 244 in syn. 1983.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 181. 1927; Mold., Phytologia 42: 34--35. 1979; Mold., Phytol. Mem. 2: 110, 118, 159, 404, 426, 428, 619, & 628. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980; Mold., Phytologia 50: 263 (1982) and 54: 128 & 244. 1983.

Recent collectors describe this plant as a small heliophytic herb, 12--15 cm. tall, the leaves bright- or light-green, the sheaths "paler on the lower surface", the flower-heads white, and the involucre bractlets "black-gray with white spots" [tufts of hair?]. They have found it growing in caatinga, in "mixed restinga, mainly high restinga on drier ground with areas of normally wet sedge meadow [brejo]", in wet sand and in shallow pools in a region of sandstone rocks and open scrub on rocky hillsides, in wet places with *Sphagnum*, in wet sandy soil, and "in flush by

roadside between rocks in area of sandstone rocks intersected by small streams with some disturbed areas by roadsides", at 500--1180 m. altitude, in both flower and fruit in January, February, April, and July.

The Maas & Carauta 3148, cited below, is a mixture with *Leiothrix dielsii* Ruhl. and it is very possible that the description given on the label (see above) really applies only to that (major) part of the collection. Surely on herbarium sheets the inflorescence heads of *P. tortilis* appear to be almost black.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18052 (Ld, N, W--2936331), 18691 (Ld, N, W--2936328), 18725 (Ld, N, W--2936327); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15957 (W--2771332); Hatschbach & Guimaraes 42414 (Ld). Rio de Janeiro: Araujo & Maciel 4019 [Herb. FEEMA 14859] (Ld); Maas & Carauta 3148 in part (Ut--355112B); L. B. Smith 6590 (W--2120188); Sucre, Graziela, Ichaso, & Carvalho 175201 (W--2948091); Ule 868 (W--2699215). MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 24. 1831 (N, W); Kunth, Enum. Pl. 3: 502--503 & 572. 1841 (N, W); A. St.-Hil., Voy. Dist. Diam. 1: 392. 1833 (N, W).

PAEPALANTHUS TORTILIS var. *GLABERRIMUS* Mart. & Mold.

Additional bibliography: Mold., Biol. Abstr. 64: 4787. 1977; Mold., Phytologia 37: 55. 1977; Mold., Phytol. Mem. 2: 159, 404, & 619. 1980.

Additional citations: BRAZIL: Rio de Janeiro: Araujo 3297 [Herb. FEEMA 15489] (Ld).

PAEPALANTHUS TORTILIS var. *MINOR* Mold.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 37: 55. 1977; Mold., Phytol. Mem. 2: 159 & 619. 1980.

PAEPALANTHUS TRIANGULARIS (L.) Körn.

Additional & emended bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 206. 1791; Savage, Cat. Linn. Herb. Lond. 21. 1945; "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 127--129. 1977; Mold., Phytol. Mem. 2: 159, 432, & 619. 1980.

PAEPALANTHUS TRICHOLEPIS Alv. Silv.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 129--130. 1977; Mold., Phytol. Mem. 2: 159, 428, & 619. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 32--33, pl. 14. 1928 (Ld, N, W).

PAEPALANTHUS TRICHOPEPLUS Alv. Silv.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 252. 1977; Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytol. Mem. 2: 159 & 620. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 20075 (W--2598326), 20076 (W--2569053A). MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 151--152, pl. 95. 1928 (Ld, N, W).

PAEPALANTHUS TRICHOPETALUS Körn.

Additional bibliography: Domin, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 248. 1911; "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Phytologia 35: 130--131. 1977; Mold., Phytol. Mem. 2: 159 & 620. 1980.

Gardner misidentified and distributed his material of this taxon as *Eriocaulon* sp.

Additional citations: BRAZIL: Minas Gerais: G. Gardner 5268 (W--1067054--isotype).

PAEPALANTHUS TRICHOPHYLLUS (Bong.) (Körn.

Additional bibliography: "M. P. B." [Mold.], Biol. Abstr. 63: 6594. 1977; Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 252--253. 1977; Hocking, Excerpt. Bot. A. 31: 17. 1978; Mold., Phytol. Mem. 2: 159 & 620. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980

Recent collectors describe this plant as an erect branched herb, 25--35 cm. tall, the leaves gray- or grayish-green, the involucre bractlets brown or dark-brown, and the florets whitish. They have found it growing in dry places on campo rupestre, in marshes in a region of "sandstone, conglomerate, metamorphic and quartzite rock outcrops with associated scrubby vegetation with damp flushes, grassland, and marsh in some areas", at 1300--1850 m. altitude, flowering and fruiting in March and July.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19727 (Ld, N, W--2936315), 19729 (Ld, N, W--2936314), 19733 (Ld, N, W--2936313); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16066 (W--2791566). MOUNTED CLIPPINGS: Kunth, Enum. Pl. 3: 579. 1841 (N, W).

PAEPALANTHUS TRUXILLENSIS Körn.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 181. 1927; Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 253--254. 1977; Mold., Phytol. Mem. 2: 118 & 620. 1980.

Recent collectors describe this plant as having the leaves dull pale-green or rich-green on both surfaces, the flower-heads white or dull-white, and the involucre bractlets "gray-black" or "black-green". They have encountered it on paramos, at 3000--3200 m. altitude, flowering in June.

Knuth (1927) cites only *Linden* 297 from Trujillo, Venezuela.

Additional citations: VENEZUELA: Apure: Steyermark, Dunsterville, & Dunsterville 98629 (N), 101142 (N). Lara: Liesner, Gonzalez, Wingfield, & Burandt 8054 (Ld). Táchira: Steyermark 57371 (W--1901728).

PAEPALANTHUS TUBERCULATUS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 254. 1977; Mold., Phytol. Mem. 2: 159 & 620. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 222--224, pl. 147. 1928 (Ld, N, W).

PAEPALANTHUS TUBEROSUS (Bong.) Kunth

Additional synonymy: *Paepalanthus tuberosus* (Bong.) Ruhl. ex Mold., Phytologia 54: 244 in syn. 1983.

Additional & emended bibliography: Bong., Mem. Acad. Imp. Sci. St.-Petersb., ser. 6, 1: 629--630. 1831; Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 254--255 & 279. 1977; Mold., Phytol. Mem. 2: 159 & 620. 1980; Mold., Phytologia 44: 244. 1983.

Citations: MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 29. 1831 (N, W); Kunth, Enum. Pl. 3: 575. 1841 (N, W).

PAEPALANTHUS ULEANUS Ruhl.

Additional bibliography: Mold., Phytologia 42: 35. 1979; Mold., Phytol. Mem. 2: 159 & 620. 1980.

PAEPALANTHUS UNCINATUS G. Gardn.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 256. 1977; Mold., Phytol. Mem. 2: 159 & 620. 1980.

PAEPALANTHUS UNDULATUS Ruhl.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 256--257 & 278. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS URBANIANUS Ruhl.

Additional bibliography: Anon., Roy. Bot. Gard. Kew Lib. Awaren. 8: 33. 1978; Mold., Phytologia 42: 35. 1979; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Additional citations: BRAZIL: Goiás: W. R. Anderson 7689 (W--2755406).

PAEPALANTHUS URBANIANUS var. *ANGUSTIFOLIUS* Mold.

Additional bibliography: Mold., Phytologia 42: 35. 1979; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS USTERII Beauverd

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 258--259. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Citations: MOUNTED CLIPPINGS: Beauverd, Bull. Herb. Boiss., ser. 2, 8: 295. 1908 (N, W).

PAEPALANTHUS VAGINANS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 259. 1977; Mold., Phytol. Mem. 2: 160 & 620.

1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 166--167, pl. 106. 1928 (Ld, N, W).

PAEPALANTHUS VAGINATUS Körn.

Additional bibliography: Phytologia 35: 259--260. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Santos, Souza, & Fonsêca 22825 (W--2582553A).

PAEPALANTHUS VARIABILIS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 261. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Serr. Min. 49. 1908 (W); Alv. Silv., Fl. Mont. 1: 154--156, pl. 97 & 98. 1928 (Ld, N, W).

PAEPALANTHUS VARIABILIS var. *GLABRESCENS* Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 261. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 156. 1928 (Ld, N, W).

PAEPALANTHUS VELLOZIOIDES Körn.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 260, 262--263, & 279 (1977) and 37: 35. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Additional citations: BRAZIL: Minas Gerais: Maguire, Maguire, & Murca Pires 44680 (Ld, N).

PAEPALANTHUS VELUTINUS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 264. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 145--147, pl. 91. 1928 (Ld, N, W).

PAEPALANTHUS VENETIFOLIUS Mold. & Steyermark.

Additional bibliography: Mold., Phytologia 42: 35. 1979; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Additional citations: VENEZUELA: Bolívar: Steyermark, Espinoza, & Brewer-Carías 109405 (W--2813879--isotype). MOUNTED ILLUSTRATIONS: Mold. in Steyermark & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: [285], fig. 4. 1976 (Ld).

PAEPALANTHUS VENUSTOIDES Mold.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 35: 264. 1977; Mold., Phytol. Mem. 2: 118, 427, & 620. 1980.

Additional citations: MOUNTED ILLUSTRATIONS: Mold., Act. Biol.

Venez. 2: 49. 1957 (Ld); Soukup, Biota 5: 302. 1959 (Ld).

PAEPALANTHUS VENUSTUS Mold.

Additional bibliography: Mold., Biol. Abstr. 64: 686. 1977; Mold., Phytologia 37: 55 (1977) and 38: 126. 1977; Hocking, Excerpt. Bot. A.31: 17 & 18. 1978; Mold., Phytol. Mem. 2: 118 & 620. 1980.

Recent collectors have found this plant growing at 1650 m. altitude.

Additional citations: VENEZUELA: Bolivar: B. Maguire 32800 (W--2168891), 32840 (W--2168893--isotype), 32884 (W--2168894); Steyermark, Berry, Dunsterville, & Dunsterville 117452a (Ld).

PAEPALANTHUS VESTITUS Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytologia 42: 35. 1979; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS VESTITUS var. *CAULESCENS* Mold.

Additional bibliography: Mold., Phytologia 42: 35. 1979; Mold., Phytol. Mem. 2: 160 & 620. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980.

Recent collectors describe this plant as shrubby, with an erect to creeping stem to 1 m. long and with spiral phyllotaxy, the leaves silvery-gray. They have found it growing in the shade of rocks in a region of "sandstone, conglomerate, metamorphic and quartzite rock outcrops with associated scrubby vegetation with damp flushes, grassland, and marsh in some areas", at 1500--1850 m. altitude, in flower and fruit in February and March.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19579 (K, K), 19704 (N).

PAEPALANTHUS VIGIENSIS Mold.

Additional bibliography: Mold., Phytologia 35: 278. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS VILLIPES Mold.

Synonymy: *Paepalanthus viliipes* Mold., Phytologia 54: 244 in syn. 1983.

Additional bibliography: Mold., Phytologia 35: 278--279. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980; Mold., Phytologia 54: 244. 1983.

Additional citations: BRAZIL: Pará: Murça Pires 4082 (W--2221370).

PAEPALANTHUS VILLOSULUS Mart.

Additional bibliography: Domin, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 248. 1911; Mold., Phytologia 35: 279--280. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS VIRIDIPES Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 280. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 115--116, pl. 71. 1928 (Ld, N, W).

PAEPALANTHUS VIRIDIS Körn.

Additional bibliography: Mold., Phytologia 42: 35--36. 1979; Mold., Phytol. Mem. 2: 118, 160, & 620. 1980.

Recent collectors describe this plant as having dull-green leaves and "pale-white" flowering heads. They have found it growing on sandy shaded banks bordering roadside ditches, at 250--300 m. altitude, in both flower and fruit in November.

Additional citations: VENEZUELA: Táchira: Steyermark, Liesner, & González 119549 (Ld).

PAEPALANTHUS VIRIDULUS Ruhl.

Additional bibliography: Mold., Phytologia 35: 281--282. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS VISCOSUS Mold.

Additional bibliography: Mold., Phytologia 35: 282. 1977; Mold., Phytol. Mem. 2: 125 & 620. 1980.

Huber & Tillett have encountered this plant in extensive shrubby matorrales and frequent on banks, in the open, and in anegadizas areas, at 100--120 m. altitude, in both flower and fruit in March and July, describing the inflorescence heads as white or dark-gray and dry. They further state that it "formando pequeños cojines, frecuente en la sabana y sobre el arena desnuda de la antigua carretera".

Additional citations: VENEZUELA: Amazonas: O. Huber 5150 (Ld); Huber & Tillett 5352 (Ld), 5447 (Ld). SURINAM: Archer 2836 (W--2250358--isotype); Maguire & Stahel 23665 (W--1907850), 24979 (W--1907846).

PAEPALANTHUS WARMINGIANUS (Körn.) Körn.

Additional bibliography: Mold., Phytologia 35: 282--283. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS WEBERBAUERI Ruhl.

Additional bibliography: Mold., Phytologia 42: 36. 1979; Mold., Phytol. Mem. 2: 134 & 620. 1980.

PAEPALANTHUS WEDDELLIANUS Körn.

Additional bibliography: Mold., Phytologia 35: 283--284. 1977; Mold., Phytol. Mem. 2: 160 & 620. 1980.

PAEPALANTHUS WILLIAMSII Mold.

Additional bibliography: Mold., Phytologia 42: 36. 1979; Mold., Phytol. Mem. 2: 110, 118, 160, & 620. 1980; Hocking, Excerpt. Bot. A.36: 22. 1981.

Recent collectors describe this plant as 30 cm. tall, the

flowers cream color or "tan", and "the inflorescence producing plantlets". They have found it growing in white sand of flooded campina, in forests next to white sand savannas, in sandy soil of campo fechada, and "not common" in very wet spots of white sand campina, in flower in June, July, and November, and in fruit in April and May.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18166 (W--2198895). VENEZUELA: Amazonas: Davidse, Huber, & Tillett 16962 (Ld); Huber, Tillett, & Davidse 3770 (Ld); Maguire & Wurdack 34549 (W--2168930); Maguire, Wurdack, & Keith 41757 (W--2279317). BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2671 (Ld, W--2931234); Cid, Buck, Nelson, Almeida, Mota, & Lima 466 (Ld). Pará: Froes 29934 (W--2343719). Roraima: Steward, Araujo, Buck, Ramos, & Ribamar 97 (Ld, N, N, W--2930232).

PAEPALANTHUS WURDACKI Mold.

Additional bibliography: Mold., *Phytologia* 35: 284--285. 1977; Mold., *Phytol. Mem.* 2: 134 & 620. 1980.

PAEPALANTHUS XANTHOPUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 285. 1977; Mold., *Phytol. Mem.* 2: 160 & 620. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 70--72, pl. 41. 1928 (Ld, N, W).

PAEPALANTHUS XIPHOPHYLLUS Ruhl.

Additional bibliography: Mold., *Phytologia* 35: 285. 1977; Mold., *Phytol. Mem.* 2: 160 & 620. 1980.

PAEPALANTHUS YUCCA Ruhl.

Additional bibliography: Mold., *Biol. Abstr.* 64: 1838. 1977; Mold., *Phytologia* 35: 285--286. 1977; Hocking, *Excerpt. Bot. A.31*: 17. 1978; Angely, *S. Amer. Bot. Bibl.* 2: 674. 1980; Mold., *Phytol. Mem.* 2: 160 & 620. 1980.

PHILODICE Mart.

Additional & emended bibliography: Meisn., *Pl. Vasc. Gen.* 2: 312. 1843; Durand, *Ind. Gen. Phan.* 454. 1888; Post & Kuntze, *Lexicon* 431 & 623. 1904; Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 707. 1911; Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. *Fl. Venez.*] 183. 1927; Rouleau, *Guide Ind. Kew.* 145 & 270. 1970; Thanikaimoni, *Inst. Franc. Pond. Trév. Sect. Scient. Techn.* 13: 180 & 285. 1976; Giulietti, *Bol. Bot. Univ. S. Paulo* 6: [61] & 63. 1978; Hocking, *Excerpt. Bot. A.31*: 17 & 18. 1978; Mold., *Phytologia* 42: 36 & 509. 1977; Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 45, 47, 54, & 59, fig. 101. 1979; Mold., *Phytologia* 45: 40 & 509. 1980; Mold., *Phytol. Mem.* 2: 111, 118, 123, 125, 160, 172, 426, 430, 431, & 620. 1980; Hocking, *Excerpt. Bot. A.36*: 22. 1981; Badillo, Schnee, & Rojas, *Ernstia* 14: [Clave *Fam. Pl. Sup. Venez.*, ed. 6] 213. 1983; Mold., *Phytologia* 52: 508 (1983), 54: 244 (1983), and 54: 509. 1983.

PHILODICE CUYABENSIS (Bong.) Körn.

Additional synonymy: *Philodice cuyabensis* (Bong.) Ruhl. ex Mold., *Phytologia* 54: 244 in syn. 1983.

Additional bibliography: Mold., *Biol. Abstr.* 64: 1838; Mold., *Phytologia* 35: 288--289 (1977) and 38: 50. 1977; Hocking, *Excerpt. Bot. A.* 31: 17. 1978; Mold., *Phytol. Mem.* 2: 160 & 620. 1980; Mold., *Phytologia* 54: 244. 1983.

Poole refers to this plant as an infrequent annual, to 5 cm. tall, with whitish inflorescence heads, and found it in flower and fruit in June.

Additional citations: BRAZIL: Amazonas: Poole 1795 (N). MOUNTED CLIPPINGS: Bong., *Ess. Monog. Erioc.* 34. 1831 (W); Kunth, *Enum. Pl.* 3: 571. 1841 (N, W).

PHILODICE HOFFMANNSEGGII Mart.

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 183. 1927; Hocking, *Excerpt. Bot. A.* 31: 17 & 18. 1978; Mold., *Phytologia* 42: 36. 1979; Monteiro, Giuliotti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 45, 47, 54, & 59, fig. 101. 1979; Mold., *Phytol. Mem.* 2: 111, 118, 123, 125, 160, 172, 426, & 620. 1980; Hocking, *Excerpt. Bot. A.* 36: 22. 1981.

Additional illustrations: Monteiro, Giuliotti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 59, fig. 101. 1979.

Recent collectors describe this plant as 10 cm. tall, growing in tufts, with white or "dirty-white" inflorescence heads. They have found it growing in wet sandy soil, in places visited by cattle near swamps, in sandy soil of campo rupestre, in seepage areas and sandy spots in low forested areas around ponds. "rare in sandy areas along airstrips", and "rare on beach dunes in association with *Anacardium*, *Byrsonima*, and *Chrysobalanus*", at 62--900 m. altitude, in both flower and fruit in March, June, and December.

Knuth (1927) cites Gaillard 167 and Passarge & Selwyn 352, 359, & 577 from Bolívar, Venezuela.

Material of this species has been misidentified and distributed in some herbaria as *Paepalanthus bifidus* (Schrud.) Kunth.

Additional citations: COLOMBIA: Magdalena: Haught 2357 (W--1707006). VENEZUELA: Apure: Davidse & González 13695 (Ld). Bolívar: Wurdack & Monachino 39958 (W--2223431). Guárico: Delascio, Montes, & Davidse 11202 (Ld), 11273 (E--2994260). GUYANA: Goodland & Persaud 778 (W--2548132); Maas, Westra, & al. 4105 (Ld, N); A. C. Smith 2284 (W--1776734). SURINAM: Freund & Freund R.26b (W--2371503); Irwin, Prance, Soderstrom, & Holmgren 55932 (W--2515086). BRAZIL: Mato Grosso: Malme 1634 (W--1483434); Prance & Schaller 26250 (Ld, N); Rosa & Santos 1973 (N). Minas Gerais: Hatschbach 42897 (Ld, W--2931959). Pará: Austin, Nauman, Nelson, & Prince 6951 (Ld, N). Piauí: G. Gardner 2749bis (W--1440337).

RONDONANTHUS Herzog

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 180. 1927; Rouleau, *Guide Ind. Kew.* 164 & 270. 1970; Mold., *Biol. Abstr.* 64: 1838. 1977; Hocking, *Excerpt.*

Bot. A.31: 17 & 18. 1978; Mold., *Phytologia* 37: 56 & 510. 1977; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Mold., *Phytologia* 42: 36--37 & 510 (1979) and 45: 40 & 510. 1980; Mold., *Phytol. Mem.* 2: 118, 123, 398, 436, & 620. 1980; Hocking, *Excerpt. Bot.* A.36: 22. 1981; Mold., *Phytologia* 50: 245 & 510 (1982) and 54: 263. 1983; Badillo, Schnee, & Rojas, *Ernstia* 14: [Clave Fam. Pl. Sup. Venez., ed. 6] 213. 1983; Mold., *Phytologia* 54: 510. 1984.

RONDONANTHUS MICROPETALUS Mold.

Additional bibliography: Mold., *Phytologia* 37: 56. 1977; Hocking, *Excerpt. Bot.* A.31: 17 & 18. 1978; Mold., *Phytol. Mem.* 2: 118 & 620. 1980.

Additional citations: VENEZUELA: Bolívar: J. A. Steyermark 58777 (W--1901784--isotype).

RONDONANTHUS RORAIMAE (Oliv.) Herzog

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 180. 1927; Hocking, *Excerpt. Bot.* A.31: 17 & 18. 1978; Mold., *Phytologia* 42: 36--37. 1979; Mold., *Phytol. Mem.* 2: 118, 123, 398, 436, & 620. 1980; Hocking, *Excerpt. Bot.* A.36: 22. 1981; Mold., *Phytologia* 50: 245 (1982) and 54: 263. 1983.

Recent collectors have encountered this plant at 2500 m. altitude, in fruit in February.

Knuth (1927) cites "Connell & Quelch" 102, 305, & 660, *ImThurn* 294, and *Ule s.n.* from Roraima, Venezuela. The Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115885, distributed as *R. roraimae*, actually is *Paepalanthus duidae* Gleason.

Additional citations: VENEZUELA: Amazonas: Steyermark, Brewer-Carías, & Liesner 124469 (N). Bolívar: J. A. Steyermark 58799 (W--1987387). GUYANA: *ImThurn* 294 (W--253901--isotype). BRAZIL: Roraima: Lützelburg 21605 [Macbride photos 18723] (Ld--photo). MOUNTED CLIPPINGS: Oliv., *Trans. Linn. Soc. Lond. Bot.* 2: 286. 1887 (N, W).

SYNGONANTHUS Ruhl.

Additional & emended bibliography: Raf., *Atl. Journ.*, imp. 1, 1: 121. 1832; Post & Kuntze, *Lexicon* 219, 546, & 623, 1904; Ruhl. in Wettstein, *Denkschr. K. Akad. Wiss. Wien Math.-Nat.* 79: 87. 1908; Thonner, *Blütenpfl. Afr.* 129. 1908; Thonner, *Flow. Pl. Afr.* 121. 1915; J. C. Willis, *Dict. Flow. Pl.*, ed. 5, 635. 1925; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 180--182. 1927; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 6, imp. 1, 418, 430, 656, & 1095. 1931; Raf., *Autikon Bot.*, imp. 2, 189. 1943; Raf., *Atl. Journ.*, imp. 2, 1: 121. 1946; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 6, imp. 2, 418, 430, 656, & 1095. 1948; Lawrence, *Taxon. Vasc. Pl.*, imp. 1, 405 & 818. 1951; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 6, imp. 3, 635 (1951) and ed. 7, 418, 430, 656, & 1095. 1966; Rouleau, *Guide Ind. Kew.* 110, 183, & 270. 1970; Lawrence, *Taxon. Vasc. Pl.*, imp. 2, 405 & 818. 1971; Wedge, *Pl. Names*, ed. 1, 18 (1973) and ed. 2, 24. 1974; Hocking, *Excerpt. Bot.* A.23: 291--293 & 388. 1974; Galvão & Caval-

cante, Bol. Mus. Para. Goeldi, ser. 2, Bot. 1: 3 & 15. 1975; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Techn. 13: 229 & 285. 1976; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 8: 33 (1978), 9: 23 & 33 (1978), and 10: 27. 1978; C. D. Cook in Heywood, Flow. Pl. World 281 & 282, fig. 2. 1978; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Hocking, Excerpt. Bot. A.31: 17 & 18. 1978; Monteiro-Scanavacca & Mazzoni, Revist. Bras. Bot. 1: [59]. 1978; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 2: 28 & 39. 1979; Anon., Biol. Abstr. 68: 4592. 1979; Benson, Pl. Classif., ed. 2, 373. 1979; Cronquist, How Know Seed Pl. 124--125, fig. 265. 1979; Hocking, Excerpt. Bot. A.33: 5, 87, 89, & 165. 1979; Kral, in Godfrey & Wooten, Aquat. Wetl. Pl. Southeast. U. S. 520 & 529--530, fig. 307. 1979; Mold., Phytologia 42: 30, 31, 37--44, 199--208, & 511 (1979), 43: 356 & 511 (1979), and 44: 215--216, 384, & 511. 1979; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43]--47, 53, & 58, fig. 70--88. 1979; Angely, S. Am. Bot. Bibl. 2: 670, 671, 673, 675, & 678. 1980; Mold., Phytologia 45: 40, 209, 477, 478, & 511, pl. 5 (1980), 46: 155 & 511 (1980), and 47: 17. 1980; Mold., Phytol. Mem. 2: 16, 18, 20, 24--26, 67, 74, 82, 84, 91, 92, 96, 111, 112, 119, 120, 123, 125, 126, 129, 135, 163--168, 172, 175, 179, 180, 190, 205, 207, 209, 213, 217, 221, 223, 228, 234, 236, 238, 246, 251, 361, 373, 379, 397, 398, 400, 401, 404, 405, 418, 424--428, 435, 441--444, 463, 498, & 620--628. 1980; Hocking, Excerpt. Bot. A.35: 324. 1980; J. T. & R. Kortesz, Syn. Checklist Vasc. Fl. 2: 197. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76--77. 1980; Cronq., Integ. Syst. Classif. 1118. 1981; Duncan & Kortesz, Vasc. Fl. Ga. 36. 1981; Hocking, Excerpt. Bot. A.36: 22 & 23. 1981; Mold., Phytologia 47: 511 (1981), 48: 291 & 511 (1981), and 49: 293 & 511. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Tecn. 89: 8, 52, & 53. 1981; Cronq. in S. P. Parker, Synop. Classif. Liv. Organisms 1: 472. 1982; Hocking, Excerpt. Bot. A.39: 101. 1982; Mold., Phytologia 50: 215, 234, 243, 245, 246, 248, 263, 264, 270, & 511 (1982), 51: 245, 302, & 508 (1982), and 52: 19, 111, 112, & 231--232. 1982; Reis & Lipp, New Pl. Sources Drugs 22. 1982; Wunderlin, Guide Vasc. Pl. Cent. Fla. 125 & 126. 1982; Badillo, Schnee, & Rojas, Erastia 14: [Clave Fam. Pl. Sup. Venez., ed. 6] 213. 1983; Mold., Phytologia 52: 511 (1983), 53: 264, 270, 311, 320, 367, 368, & 510 (1983), and 54: 68, 69, 122, 131, 136, 139, 144, 145, 232, 234, 235, 237, 238, 244, 259, 263, 269, 436, 439, & 451. 1983; Ramaswamy, Arekal, & Kaju, Bull. Torrey Bot. Club 110: 289. 1983; Mold., Phytologia 54: 511 (1984) and 55: 43, 45, & 52. 1984.

The Maas & Westra 4029, distributed as *Syngonanthus* sp., actually is *Eriocaulon tenuifolium* Klotzsch, while Rabelo 6 is *E. aquatile* var. *latifolium* Mold., Moore, Ambrose, Diez, & Pfister 9813 is *Paepalanthus cumbricola* Mold., and Rosa & Santos 9813 is *P. oyapockensis* Herzog.

SYNGONANTHUS ACIPHYLLUS (Bong.) Ruhl.

Additional bibliography: Mold., Biol. Abstr. 64: 1838. 1977; Mold., Phytologia 35: 303 & 309--310 (1977) and 37: 487. 1977;

Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytol. Mem. 2: 163, 397, 442, & 620. 1980.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35448 (W—2709604).

SYNGONANTHUS ACOPANENSIS Mold.

Additional bibliography: Mold., Phytologia 35: 310. 1977; Mold., Phytol. Mem. 2: 119 & 620. 1980; Mold., Phytologia 50: 245 (1982) and 54: 131, 136, & 263. 1983.

Recent collectors describe this plant as growing in clumps, the leaves subcoriaceous but flexible, erect, stiff, rich- or grass-green throughout, the inflorescence heads dry, gray, grayish-white, or "gray and blackish", the bracts blackish, the flowers themselves dull-white. They have encountered it in openings in zanjon, in wet soil of large swamps, in *Chimantaea mirabilis* vegetation, and in low scrub of *Mallophyton chimantensis*. It is said to be in and at the margins of *Mallophyton-Brocchinia* areas, frequently forming small colonies in small open depressions, frequently among 30--40 cm. tall grasses, on open sandy banks of rivers mixed with *Leiostrix flavescens* var. *alpina* Mold., and at the edges of sandstone rock formations bordering subsavannas of *Mallophyton* and *Chimantaea*, at altitudes of 2200--2685 m. altitude, in both flower and fruit in January, February, and June. Steyermark refers to the leaves as "membranous" and ascending, but actually they are subcoriaceous or coriaceous.

Material of this taxon has been misidentified and distributed in some herbaria as *Paepalanthus duidae* Gleason. On the other hand, the Maguire & al. 65638, distributed as *S. acopanensis*, actually is *Paepalanthus duidae* Gleason, while Steyermark 75926 is the type collection of *Leiostrix mucronata* var. *glabra* Mold.

Additional citations: VENEZUELA: Bolívar: Huber & Steyermark 6964 (Ld), 6970 (Ld), 7160 (Ld); J. A. Steyermark 75925 (W—2407778); Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115818a (Ld); Steyermark, Huber, & Carreño E. 128165 in part (Ld), 128872 (Ld), 128938 (Ld).

SYNGONANTHUS ALBOPULVINATUS (Mold.) Mold.

Additional bibliography: Mold., Phytologia 35: 310--311. 1977; Mold., Phytol. Mem. 2: 119, 123, 442, & 620. 1980.

Recent collectors describe this plant as a rosulate herb, with the leaves blue- or gray-green or "green with gray-white hairiness", and the inflorescence heads white, "dull-white", or grayish-white. They have found it growing "in separate gray white clumps" in open sandstone rocky areas bordering wet savannas and frequent in sand-openings on savannas, at 850--2200 m. altitude, in both flower and fruit in January, February, April, and October and December.

Material of this species has been misidentified and distributed in some herbaria as *S. gracilis* var. *koernickeanus* Ruhl.

Additional citations: VENEZUELA: Amazonas: O. Huber 3629 (Lc). Bolívar: Huber, Alarcon, & Barreat 6769 (Ld); Steyermark, Huber, & Carreño E. 128256 (Ld); Steyermark & Nilsson 638 (M, N, N, (W—2486248); Steyermark & Pruski 121065 (Ld); Steyermark & Wurdack

363 (W--2168505, W--2407715). GUYANA: *Maas, Mennega, & Groen* 5699 (Ld).

SYNGONANTHUS ALLENI Mold.

Additional bibliography: Mold., *Phytologia* 42: 37. 1979; Mold., *Phytol. Mem.* 2: 111, 119, 163, & 620. 1980; Hocking, Excerpt. Bot. A.36: 22. 1981.

Additional citations: BRAZIL: Pará: *Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Santos* P.25250 (W--2868551).

SYNGONANTHUS ALLENI var. *BRASILIENSIS* Mold.

Additional bibliography: Mold., *Phytologia* 35: 311--312. 1977; Mold., *Phytol. Mem.* 2: 163 & 620. 1980.

SYNGONANTHUS ALLENI var. *PARVUS* Mold.

Additional bibliography: Mold., *Phytologia* 35: 312. 1977; Mold., *Phytol. Mem.* 2: 119 & 620. 1980.

Huber refers to this plant as growing in "wet places".

Additional citations: VENEZUELA: Amazonas: *Huber* 2341 (Ld).

SYNGONANTHUS AMAPENSIS Mold.

Additional bibliography: Mold., *Phytologia* 35: 312. 1977; Mold., *Phytol. Mem.* 2: 111, 163, & 620. 1980.

García-Barriga refers to this plant as an erect herb growing in isolated groups, the inflorescence white, and encountered it on savannas, at 400 m. altitude, in both flower and fruit in August. His no. 20859, cited below, bears a label inscribed "bejuco, frutos amarillos" -- obviously a case of mixed labels or stenographic error.

Additional citations: COLOMBIA: Guainía: *García-Barriga* 20814 (W--2844179), 20830 (W--2844152), 20859 (W--2844156).

SYNGONANTHUS AMAZONICUS Mold.

Additional bibliography: Mold., *Phytologia* 35: 312. 1977; Mold., *Phytol. Mem.* 2: 163 & 621. 1980.

SYNGONANTHUS ANDROSACEUS (Griseb.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.31: 17 & 18. 1978; Mold., *Phytologia* 42: 37. 1979; Mold., *Phytol. Mem.* 2: 91, 442, & 621. 1980.

Additional citations: CUBA: Pinar del Rio: *Ekman* 10792 (W--1302520); *C. Wright* 3236 (W--46432).

SYNGONANTHUS ANGOLENSIS H. Hess

Additional bibliography: Mold., *Phytologia* 35: 308 & 313--314 (1977), 37: 82, 83, & 93 (1977), and 38: 26 & 33. 1977; Mold., *Phytol. Mem.* 2: 234, 444, & 621. 1980.

Citations: MOUNTED ILLUSTRATIONS: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: text fig. 7 & 8, pl. 9, fig. 10 & 13. 1955 (Ld).

SYNGONANTHUS ANGUSTIFOLIUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 314--315 (1977)

and 37: 85. 1977; Mold., *Phytol. Mem.* 2: 163 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 370--371, pl. 236. 1928 (Ld, N, W).

SYNGONANTHUS ANOMALUS (Körn.) Ruhl.

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. *Fl. Venez.*] 181. 1927; Mold., *Phytologia* 37: 56--57, 87, & 260 (1977) and 38: 23. 1977; Mold., *Phytol. Mem.* 2: 111, 119, 123, 125, 163, 442, & 621. 1980.

Recent collectors describe this plant as having rich-green leaves, growing in dense stands on wet banks, "en lecho de quebrada seca", and "frecuente en la orilla del caño, cabezuelas blancuecinas", at 180--750 m. altitude, in both flower and fruit in February and November.

Knuth (1927) cites Spruce 3259 from Bolívar, Venezuela. The Murca Pires & Silva 4380, distributed as *S. anomalus* and so cited in a previous installment of these notes, actually is *S. macrocaulon* Ruhl.

Additional citations: VENEZUELA: Amazonas: Huber & Medina 5934 (Ld); Maguire, Steyermark, & Maguire 60118 (N); Maguire, Wurdack, & Bunting 36645 (W--2168980); Maguire, Wurdack, & Maguire 42634 (W--2279367); Steyermark, Guariglia, Holmgren, Luteyn, & Mori 126193 (Ld). Bolívar: Agostini 264 (W--3328556). SURINAM: Irwin, Prance, Soderstrom, & Holmgren 55267 (W--2514871). BRAZIL: Amazonas: Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17814 (W--2772583); Prance, Maas, Wootcott, Coêlho, Monteiro, & Ramos 15233 (W--2801670); Prance, Maas, Wootcott, Monteiro, & Ramos 15541 (W--2801667); Prance, Pennington, Nelson, & Ramos 21646 (N, W--2935279).

SYNGONANTHUS ANTHEMIFLORUS (Bong.) Ruhl.

Additional synonymy: *Eleocharis chrysanthemifolium* Schnitzl., *Iconogr.* 1: pl. 46, fig. 3. 1845.

Additional bibliography: Mold., *Phytologia* 37: 57, 96, 254, & 255 (1977) and 38: 38. 1977; Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 45, 47, 53, & 58, fig. 79--82. 1979; Mold., *Phytol. Mem.* 2: 163, 190, 400, 424, 425, 442, & 621. 1980.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 58, fig. 79--82. 1979.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 36202 (W--2709607); Glaziou 19981 (W--1580392); L. B. Smith 6845 (W--2120214). MOUNTED CLIPPINGS & ILLUSTRATIONS: Kunth, *Enum. Pl.* 3: 579. 1841 (N, W); Schnitzl., *Iconogr.* 1: 46, fig. 3. 1845 (Ba--381101).

SYNGONANTHUS ANTHEMIFLORUS var. *SUBGLABRESCENS* Mold.

Additional bibliography: Mold., *Phytologia* 35: 319--321. 1977; Mold., *Phytol. Mem.* 2: 163 & 621. 1980.

SYNGONANTHUS APPRESSUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 37. 1979; Mold.,

Phytol. Mem. 2: 163 & 621. 1980.

SYNGONANTHUS APPRESSUS var. *CHAPADENSIS* Mold.

Additional bibliography: Mold., Phytologia 42: 37. 1979; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Additional citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32149 (W--2709888--isotype), 32203 (W--2709603).

SYNGONANTHUS AQUATICUS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 1838. 1977; Mold., Phytologia 35: 332. 1977; Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Serr. Min. 74. 1908 (W); Alv. Silv., Fl. Mont. 1: 313--314, pl. 96. 1928 (Ld, N, W).

SYNGONANTHUS AQUATICUS var. *CAESPITOSUS* Mold.

Additional bibliography: Mold., Phytologia 35: 332. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Additional citations: BRAZIL: Amazonas: Prance, Maas, Atchley, Steward, Woolcott, Coêlho, Monteiro, Pinheiro, & Ramos 13778 (W--2708459--isotype).

SYNGONANTHUS ARENARIUS (G. Gardn.) Ruhl.

Additional bibliography: Mold., Biol. Abstr. 64: 1838. 1977; Mold., Phytologia 35: 332--334. 1977; Mold., Phytol. Mem. 2: 163, 424, & 621. 1980; Mold., Phytologia 54: 237. 1983.

SYNGONANTHUS ARENARIUS var. *HETEROPHYLLUS* (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 35: 334. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980; Mold., Phytologia 54: 237. 1983.

Calderon and his associates report this plant "common in white sand campina" and describe its inflorescences as white.

Additional citations: BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2554 (Ld, W--2931217).

SYNGONANTHUS ARTHROTRICHUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 57. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 364--365, pl. 230. 1928 (Ld, N, W).

SYNGONANTHUS ATROVIRENS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 35: 335. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980.

SYNGONANTHUS AURIFIBRATUS Alv. Silv.

Additional bibliography: Mold., Phytologia 42: 37--38. 1979; Mold., Phytol. Mem. 2: 111, 163, & 621. 1980; Mold. in Harley & Mayo. Toward Checklist Fl. Bahia 76. 1980; Mold., Phytologia 54: 237. 1983.

Recent collectors have encountered this plant in wet sandy areas as well as in rather dry sand in a region of "open scrub on white sand with damp areas and extensive sedge meadows (brejo) partly burned over", at 950--1000 m. altitude, in flower in June, and in fruit in February and June. They describe it as an herb, 15 cm. tall, with gray rosettes of rigid leaves, gray scapes [peduncles], and white involucre bractlets.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18842* (Ld, N, W--2936297); *Mori & Boom 14516* (Ld, N). Rio de Janeiro: *Araujo & Maciel 5164* [Herb. FEEMA 22886] (N). MOUNTED ILLUSTRATIONS: *Alv. Silv., Fl. Mont. 1: pl. 228* (Ld, N).

SYNGONANTHUS AURIPES Alv. Silv.

Additional bibliography: *Mold., Phytologia 35: 336. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980; Hocking, Excerpt. Bot. A.36: 23. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Técn. 89: 8 & 52. 1981.*

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: *Alv. Silv., Fl. Mont. 1: 343--344, pl. 217. 1928* (Ld, N, W).

SYNGONANTHUS AURIPES var. *BAHIENSIS* Mold., *Phytologia 43: 356. 1979.*

Bibliography: *Mold., Phytologia 43: 356. 1979; Mold., Phytol. Mem. 2: 163 & 621. 1980; Hocking, Excerpt. Bot. A.36: 23. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Técn. 89: 8 & 52. 1981.*

Citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18528* (Ld--isotype, N--isotype, Ub--type, W--2936299--isotype).

SYNGONANTHUS BAHIENSIS Mold.

Additional bibliography: *Mold., Phytologia 42: 38. 1979; Mold., Phytol. Mem. 2: 163 & 621. 1980.*

Mori & Boom encountered this plant in dry sandy areas between cracks in rocks, at 1000 m. altitude, in both flower and fruit in June.

Additional citations: BRAZIL: Bahia: *Irwin, Harley, & Smith 30703* (W--2709884--isotype); *Mori & Boom 14535* (Ld, N). MOUNTED ILLUSTRATIONS: *Mold., Phytologia 27: 70, fig. 3. 1973* (Ld).

SYNGONANTHUS BALDWINI Mold.

Additional bibliography: *Mold., Phytologia 37: 57. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980.*

Martinelli describes this plant as having concolorous leaves, the "inflorescence and peduncles green", and the flowers whitish. He found it growing among rocks in swamps, at 80 m. altitude, in flower in June.

Additional citations: BRAZIL: Amazonas: *Baldwin 3546* (W--1878943). Pará: *Campbell, Ongley, Ramos, & Monteiro P.22435* (N); *Martinelli 7222* [R. B. Herb. 202921] (Ld).

SYNGONANTHUS BARBATUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 57. 1977; Mold., *Phytol. Mem.* 2: 163 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 382--383, pl. 243. 1928 (Ld, N, W).

SYNGONANTHUS BARTLETTII Mold.

Additional bibliography: Mold., *Phytologia* 35: 337--338. 1977; Mold., *Phytol. Mem.* 2: 74 & 621. 1980.

The Bartlett 11670 collection, cited below, is a mixture with *Drosera* sp. and *Xyris* sp.

Additional citations: BELIZE: Bartlett 11263 in part (W--1493358), 11670 in part (Ld--isotype, W--1493090--isotype).

SYNGONANTHUS BELLUS Mold.

Additional bibliography: Mold., *Phytologia* 42: 38 & 41. 1979; Mold., *Phytol. Mem.* 2: 119, 163, & 621. 1980.

Recent collectors describe this plant as an herb, 10--20 cm. tall, the inflorescences small and yellow, and the flowers white. They have found it very abundant on campo sujo, in solo areia, common in open areas in dense campina, frequent on savannas, and abundant in white sand campinas, at 600--1100 m. altitude, in flower in November, and in both flower and fruit in June and October.

Material of this species has been misidentified, distributed in some herbaria, and even cited by me in previous installments of these notes as *S. fertilis* (Körn.) Ruhl. and *S. humboldtii* var. *glandulosus* Gleason. The Prance & al. collection, cited below, is a mixture with *S. gracilis* var. *hirtellus* (Steud.) Ruhl. and *Panicum* sp.

Additional & emended citations: VENEZUELA: Amazonas: O. Huber 4502 (Ld). Bolívar: G. H. H. Tate 1308 (N). BRAZIL: Amapá: Murça Pires & Cavalcante 52383 (W--2514664). Amazonas: Calderón, Monteiro, & Guedes 2550 (Ld, W--2931214). Pará: Bastos, Ubiratan, Bouças, & Carvalho 101 (N); Black 50-8647 (W--2252946); Daly, Campbell, Silva, Silva, Bahia, & Santos D.921 (Ld, N); Ducke 12025 (Ld); Fróes 34572 (W--2484358); Maguire & Murça Pires 40843 (W--2198747); Prance, Pennington, & Murça Pires 1283 in part (W--2514723).

SYNGONANTHUS BICOLOR Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 338--339 & 348 (1977) and 37: 255. 1977; Mold., *Phytol. Mem.* 2: 163 & 621. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 337--338, pl. 213. 1928 (Ld, N, W).

SYNGONANTHUS BIFORMIS (N. E. Br.) Gleason

Additional bibliography: Mold., *Phytologia* 42: 38 & 42. 1979; Mold., *Phytol. Mem.* 2: 111, 119, 123, 125, 163, 442, 621, & 628. 1980; Mold., *Phytologia* 50: 264. 1982.

Recent collectors describe this species as an herb of low stature, forming dense tufts, with a rosette of leaves on the ground and with several flowering stems, many poorly developed individuals with only one flowering stem, to 10 cm. tall, the inflorescence heads white or gray-white. They have found it growing in grayish clay soil, in open areas of cerrado on white sand, on rocks densely covered with mosses and small ferns along small rocky mountain streams, in white sand on low islands with scrubby vegetation, and common in open places on wet savannas, at 150--450 m. altitude, in both flower and fruit in October and November.

The Maguire, Maguire, & Wilson-Browne 46179a, distributed as *S. biformis* and so cited by me in a previous installment of these notes, proves actually to be *S. gracilis* var. *aureus* Ruhl.

Additional citations: COLOMBIA: Vaupés: Cuatrecasas 6975 (W--1796731). VENEZUELA: Amazonas: O. Huber 1198 (Ld); Maguire & Politi 27342 (W--2046424); Maguire, Wurdack, & Keith 41474 (W--2279270); J. A. Steyermark 58468 (W--1901775). Apure: Davidse & González 15926 (Ld). Bolívar: J. A. Steyermark 59305 (W--1987406), 60484 (W--1901834); Steyermark, Dunsterville, & Dunsterville 104528 (W--2622557). GUYANA: Maas, Westra, & al. 3695 (Ld, N), 4028 (Ld, N), 4275 (Ut--270658B), 4345 (Ld, N); Maguire, Maguire, & Wilson-Browne 46012 (W--2514898), 46179a (W--2514875). SURINAM: B. Maguire 24728 (W--1907843). BRAZIL: Amazonas: Madison, Kennedy, Monteiro, & Braga 6157 (N); Steward, Araujo, Rogers, Ramos, & Ribamar 415 (Ld, N). Rondônia: Prance, Rodrigues, Ramos, & Farias 8914 (W--2573053A). Roraima: Steward, Araujo, Buck, Ramos, & Ribamar 73 (N).

SYNGONANTHUS BISULCATUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 42: 38. 1979; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41319 (N, W--2840049); Irwin, Maxwell, & Wasshausen 20536 (W--2598433); Irwin, Santos, Souza, & Fonsêca 22663 (W--2582557A); L. B. Smith 6846 (W--2120215).

SYNGONANTHUS BISULCATUS var. *ANGUSTIFOLIUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 342. 1977; Mold., Phytol. Mem. 2: 163 & 621. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 362. 1928 (Ld, N, W).

SYNGONANTHUS BISUMBELLATUS (Steud.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 57 & 90. 1977; Mold., Phytol. Mem. 2: 111, 119, 123, 163, 442, 443, & 612. 1980.

Recent collectors describe the inflorescence heads of this plant as whitish and have found it growing on wet savannas.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18449 (W--2198903). GUYANA: Maas & Westra 4050 (Ld, N).

SYNGONANTHUS BISUMBELLATUS var. *FROESII* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 35: 343 & 344. 1977; Mold., *Phytol. Mem.* 2: 164. 1980.

SYNGONANTHUS BLACKII Mold.

Additional bibliography: Mold., *Phytologia* 35: 344. 1977; Mold., *Phytol. Mem.* 2: 164 & 621. 1980.

SYNGONANTHUS BRACTEOSUS Mold.

Additional bibliography: Mold., *Phytologia* 42: 38. 1979; Mold., *Phytol. Mem.* 2: 164 & 621. 1980; Mold., *Phytologia* 52: 231--232. 1982.

Additional citations: BRAZIL: Minas Gerais: Irwin, *Fonseca, Souza, Santos, & Ramos* 27118 (W--2709886--isotype).

SYNGONANTHUS BRACTEOSUS var. *SCRUPULOSUS* Mold., *Phytologia* 52: 231--232. 1982.

Bibliography: Mold., *Phytologia* 52: 231--232. 1982.

Citations: BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2692 (Ld--type, W--2931231--isotype, W--2970400--isotype).

SYNGONANTHUS BREVIFOLIUS Gleason

Additional bibliography: Mold., *Phytologia* 35: 344--345 & 356. 1977; Mold., *Phytol. Mem.* 2: 123 & 621. 1980.

Additional citations: MOUNTED CLIPPINGS: Gleason, *Bull. Torrey Bot. Club* 56: 14. 1929 (N, W).

SYNGONANTHUS CABRALENSIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 345. 1977; Mold., *Phytol. Mem.* 2: 164, 443, & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 340--342, pl. 215. 1928 (Ld, N, W).

SYNGONANTHUS CACHIMBOENSIS Mold.

Additional bibliography: Galvão & Cavalcante, *Bot. Mus. Para. Geoldi*, ser. 2, *Bot.* 1: 3 & 15. 1975; Mold., *Phytologia* 35: 345--346. 1977; Mold., *Phytol. Mem.* 2: 164 & 621. 1980.

SYNGONANTHUS CAESPITOSUS (Wikstr.) Ruhl.

Additional bibliography: Mold., *Biol. Abstr.* 64: 1838. 1977; Mold., *Phytologia* 35: 346--347, 443, & 457 (1977) and 36: 56. 1977; Mold., *Phytol. Mem.* 2: 164, 418, & 621. 1980.

SYNGONANTHUS CANALICULATUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 339, 347--348, 438, 439, & 456. 1977; Mold., *Phytol. Mem.* 2: 164 & 621. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 327--328, pl. 208. 1928 (Ld, N, W).

SYNGONANTHUS CANASTRENSIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 348 (1977) and 38: 126. 1977; Mold., *Phytol. Mem.* 2: 164 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 368--369, pl. 233. 1928 (Ld, N, W).

SYNGONANTHUS CANDIDUS Alv. Silv.

Additional bibliography: Mold., Phytologia 42: 38. 1979; Mold., Phytol. Mem. 2: 164 & 621. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980.

SYNGONANTHUS CANDIDUS var. *BAHIENSIS* Mold.

Additional bibliography: Mold., Phytologia 42: 38. 1979; Mold., Phytol. Mem. 2: 164 & 621. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 76. 1980.

Recent collectors describe this plant as a rosette herb, to 20 cm. tall, the leaves gray and rigid, the outer involucre bracts short and stramineous, the inner ones elongate and spreading, shiny-white, and the florets creamy-white. They have found it growing on campo rupestre and in a region of "waterworn horizontally bedded sandstone at the soil surface, with damp sand, sedge marsh, exposed rock and waterfalls, the vegetation open scrub to closed low woodland in the drier areas", at 900--1000 m. altitude, in both flower and fruit in March and July.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19268 (Ld, N, W--2936296); Irwin, Harley, & Smith 32500 (W--1709902--isotype); Mori, King, Santos, & Hage 12636 (Ld, W--2854280).

SYNGONANTHUS CAPIILLACEUS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 349. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 352--353, pl. 223, fig. 2. 1928 (Ld, N, W).

SYNGONANTHUS CARACENSIS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 349--350. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 392--393, pl. 251. 1928 (Ld, N, W).

SYNGONANTHUS CARACENSIS var. *GLABRESCENS* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 350. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

SYNGONANTHUS CAULESCENS (Poir.) Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 179 & 181--182. 1927; Hocking, Excerpt. Bot. A.23: 388 (1974) and A.31: 17 & 18. 1978; Mold., Phytologia 42: 39. 1979; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43], 45--47, & 58, fig. 72--74. 1979; Angely, S. Am. Bot. Bibl. 2: 673 & 678. 1980; Mold., Phytol. Mem. 2: 67, 82, 111, 119, 123, 125, 126, 135, 164, 172, 175, 179, 180, 190, 361, 401, 404, 424, 425, 428, 443, & 621. 1980; Mold., Phytologia 50: 243 (1982), 51: 245 (1982), 53: 367--368 (1983), 54: 144, 234,

237, 238, & 436 (1983), and 55: 45. 1984.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 58, fig. 72--74. 1979.

Recent collectors have found this plant growing in wet spots in caatinga, on campo alagado arenoso, in wet dwarf forests, in wet sandy soil of campina, "locally common at pond edges", "locally frequent in shallow water of forest islands on savannas", "infrequent in dense clumps in wet sand near rivers in mist from waterfalls covered with a dense growth of 1 m. tall grass", "in wet areas on savannas leading to a canyon", on park-type natural campo, in Mauritia marshes, in rocky streams with Mauritia flexuosa, along streamsides, on sheer rock walls in the spray of waterfalls, and in drying sand of morichal, at 60--1700 m. altitude in flower in February, April, July, and December, and in fruit in January, February, April, August, October, and November. It has been described as sometimes dominant on esteros.

Collectors have described the plant as having the "base and stems white", the scape [peduncle] medium-green, the leaves light- or mid-green, the inflorescences white or whitish, the bracts light-tan, and the florets white.

Knuth (1927), listing this taxon both under *S. caulescens* and *Paepalanthus caulescens* Kunth, cites Chaffanjon 122 from Bolívar and Pittier 9405 from Carabobo, Venezuela.

The Herb. Mus. Nac. Rio Jan. 126560, cited below, is a mixture with *S. fischerianus* (Bong.) Ruhl., while Sastre 4734 is a mixture with *Utricularia* sp., Schultes & Cabrera 14968 is a mixture with *Paepalanthus lamarckii* Kunth and *P. fasciculatus* f. *tenellus* Herzog, and Steyermark 88759 is a mixture with *Tonina fluviatilis* Aubl.

Material of *S. caulescens* has been misidentified and distributed in some herbaria as *S. akurimensis* Mold., *Paepalanthus lamarckii* Kunth, *P. polytrichoides* var. *glaber* Mold., and *P. sp.*

On the other hand the Smith, Klein, & Hatschbach 14549 and Smith & Reitz 14314, distributed as and previously cited as *typi-S. caulescens*, seem actually to be var. *angustifolius* Mold., while the Maguire & Maguire 35435 is var. *bellohorizontinus* Alv. Silv., and Cuatrecasas 7886, Harley, Souza, & Ferreira 10405, Hassler 1061, 3645, 6697, 8483, & 12532, Hatschbach 22504, Hatschbach, Smith, & Klein 28243, Héninger, Filgueiras, Mendonça, & Pereira 7420, Herb. FEEMA 21843, Jørgensen 4174, Klein 3470, Macedo 2853, Mattos 4288, 4411, & 4657, Mello Barreto 2585, Mendes Magalhães 2091, Moldenke & Moldenke 19671, Oliveira 67, Pickel 5526, Rambo 30865, 34685, 34865, & 35244, Ramos & Sousa 127, Reitz & Klein 6008, 11593, 16405, & 17472, Ribeiro 199, Riedel 1480, Smith & Klein 8189, 10653, 13689, 13762, & 15502, Smith, Reitz, & Sufri-dini 9390, Tessmann 2746 & 3611, and Vilaga 192 are var. *hatschbachii* Mold., Luteyn, Lebrón-Luteyn, & Steyermark 6263 & Maguire, Wurdack, & Bunting 35909 are var. *hirsutus* Mold., G. Gardner 5253 is var. *longifolius* Mold., Steyermark 76055 & 95741 are var. *proliferus* Mold., Maguire & Wurdack 35752 is *S. glandulosus* Gleason, Cowan & Soderstrom 2154, Maguire & Maguire 40100, and Prance,

Forero, Pena, & Ramos 4488, as well as Mattos 4365 and Steyermark 60494 & 98198 are *S. glandulosus* f. *epapillosus* (Mold.) Mold., and Black 51-11027 is *S. xeranthemoides* (Bong.) Ruhl.

Additional citations: San José: Weston, Weston, & Weston 4295 (Lc). Province undetermined: Pittier 11043 [Cienaga de Agua Buena] (W--577389, W--936247, W--1080344). COLOMBIA: Magdalena: Haught 2355 (W--1707004). Valle: Cuatrecasas 7823 (W--1796746). Vaupés: Cuatrecasas 6981 (W--1796733); Schultes & Cabrera 14968 in part (W--2198877), 15406 (W--2171592), 15956 (W--2198883). VENEZUELA: Amazonas: J. A. Steyermark 58519 (W--1901777). Anzoátegui: Pittier 14450 (W--1801964); Tamayo 3548 (N). Apure: Davidse & González 13908 (Ld), 15557 (E--2733866). Bolívar: Davidse, Ramia, & Montes 4874 (E--2604033); Liesner & González 11312 (Ld), 11421 (Ld); Luteyn, Lebrón-Luteyn, & Steyermark 6263 (N); J. A. Steyermark 88759 in part (W--2435335); Steyermark & Wurdack 45b (W--2168501, W--2407713). Guárico: Aristeguieta & Tamayo 4514 (N); Delascio, Montes, & Davidse 11104 (Ld), 11465 (Ld), 11490 (Ld), 11615 (E--2994263). Monagas: Pursell, Curry, & Kremer 8293 (W--2546260). GUYANA: Tillett & Tillett 45741 (N); Tillett, Tillett, & Boyan 45216 (N). SURINAM: Irwin, Prance, Soderstrom, & Holmgren 55265 (W--2514869). FRENCH GUIANA: Cremers 4834 (Cy), Granville 2688 (Cy, Ld); Hallé 511 (Cy); Hoock 871 (Cy), s.n. [4 Mai 1957] (Cy); Reynal-Roques 20057 (Cy), 20121 (Cy), 21497 (Cy); Sastre 4734 in part (Cy). BRAZIL: Amapá: Irwin, Murça Pires, & Westra 48645 (W--2435312). Amazonas: Janssen 275 (Ld). Bahia: Mori, King, Santos, & Hage 12254 (Ld, W--2854261). Distrito Federal: Héringier 18150 (N, W--2970389); Héringier, Filgueiras, Mendonça, & Pereira 7420 (N); Héringier, Paula, Mendonça, & Salles 291 (N); Mendonça & Pereira 180 (W--2941382). Goiás: Irwin, Souza, & Reis dos Santos 9757 (W--2861728). Mato Grosso: Hatschbach 24562 (W--2705714); Prance, Lleras, & Coêlho 19232 (W--2772578); Silva & Pinheiro 4527 (N). Minas Gerais: Damasio 1505 [Herb. Jard. Bot. Rio Jan. 63770] (W--298653); Duarte 2569 [Herb. Jard. Bot. Rio Jan. 70549] (W--2928652); King & Bishop 8988 (W--2908829); J. G. Kuhlmann 78289 (W--2947267). Pará: Cid, Ramos, Mota, & Rosas 2303 [Herb. Inst. Nac. Pesq. Amaz. 96651] (Ld, N, W--2969533). Paraná: Castellanos 21869 [Herb. Mus. Rio Jan. 126569] (W--2653323); Gottsberger & Poelt s.n. [21.7.1979] (Gr--196-80); Hatschbach & Haas 13689 (Eu); Smith, Reitz, & Caldato 9585 (W--2251569); Stawiarski s.n. [Herb. Mus. Nac. Rio Jan. 126560] in part (W--2653331). Rio Grande do Sul: Pabst 77105 (W--2947266). Santa Catarina: Klein 3470 (N); Reitz & Klein 11593 (N), 16405 (N); Smith & Klein 11097 (W--2251750); Smith, Klein, & Hatschbach 15694 (W--2653312); Ule 583 (W--2699202). São Paulo: Eiten & Eiten 2348 (W--2745129); Eiten & Machado de Campos 1527 (W--2745108); Mimura 268 (W--2555593). PARAGUAY: Casas & Molero 45 (N); Lourteig 2074 (W--2557402). ARGENTINA: Corrientes: Parodi 12611 (W--2935744). MOUNTED CLIPPINGS & ILLUSTRATIONS: Abbiatti, Rev. Mus. La Plata, ser. 2, 6: pl. 2. 1946 (Ld); Miq., Linnaea 19: 126. 1847 (W); Pilger in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2 Nachtr. 3 zu 2: fig. 7. 1908 (Ld); Reitz, Fl. Illustr. Catar. I Erioc. pl. 9, p. 85.

1976 (Ld); Schnitzl., Iconogr. 1: 46, fig. 1. 1845 (Ba--381100); Tamayo, Bol. Soc. Cienc. Nat. 22: 149. 1961 (Ld).

SYNGONANTHUS CAULESCENS var. *ANGUSTIFOLIUS* Mold.

Additional bibliography: Mold., Phytologia 42: 39. 1979; Angely, S. Am. Bot. Bibl. 2: 678. 1980; Mold., Phytol. Mem. 2: 111, 119, 135, 164, 424, 425, & 621. 1980.

Recent collectors describe the inflorescence heads of this plant as white or whitish and have found it growing in marsh - grassland surrounding morichal and sand dunes and also frequent in corregal pluvial, at 70 m. altitude, in both flower and fruit in March. Hatschbach encountered it in brejo at 500 m. altitude, in flower in February.

Many collections previously regarded and distributed as representing this variety actually prove to be var. *hatschbachii* Mold.

Additional citations: COLOMBIA: Meta: Haught 2747 (W--1707286--isotype). VENEZUELA: Apure: Davidse & González 15945 (Ld). BRAZIL: Mato Grosso: Hatschbach 46170 (Ld). Pará: Cavalcante 2101 (N); M. Silva 2673 (N). Parana: Hatschbach, Smith, & Klein 28243 (W--2653339). MOUNTED CLIPPINGS: Mold., Bull. Torrey Bot. Club 68: 70. 1941 (W).

SYNGONANTHUS CAULESCENS var. *BELLOHORIZONTINUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 364. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980; Mold., Phytologia 54: 234 & 237. 1983.

The Maguires have collected what appears to be this taxon, reporting it common in wet places along streams, at 1500 m. altitude, in both flower and fruit in March. Their collection has previously been regarded as representing typical *S. caulescens* (Poir.) Ruhl.

Additional citations: VENEZUELA: Amazonas: Maguire & Maguire 35435 (N, W--2168952). MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 358. 1928 (Ld, N, W).

SYNGONANTHUS CAULESCENS var. *DISCRETIFOLIUS* Mold.

Additional bibliography: Mold., Biol. Abstr. 64: 1838. 1977; Mold., Phytologia 37: 58. 1977; Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., Phytol. Mem. 2: 164 & 621. 1980.

SYNGONANTHUS CAULESCENS var. *DOURADENSIS* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 388. 1974; Mold., Phytologia 35: 420. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

SYNGONANTHUS CAULESCENS var. *GARDNERIANUS* Mold., Phytologia 53: 367. 1983.

Bibliography: Mold., Phytologia 53: 367 (1983) and 54: 237. 1983.

Citations: BRAZIL: State undetermined: G. Gardner 5253 (N--type).

SYNGONANTHUS CAULESCENS var. *HATSCHBACHII* Mold.

Additional bibliography: Mold., *Phytologia* 42: 39. 1979; Mold., *Phytol. Mem.* 2: 164 & 621. 1980; Mold., *Phytologia* 54: 234, 237, & 238. 1983.

Recent collectors describe this plant as a semi-aquatic, to 20 cm. tall, the inflorescence heads white or whitish, sometimes "no centro um pouco amarelado". They have encountered it in swamps, in brejo, on wet, wet sandy, or marshy campo, in capoeira swamps, in bogs, and in matas de monte, at 750--3200 m. altitude, in both flower and fruit in April and from September to February.

Many of the collections cited below were previously regarded as representing typical *S. caulescens* (Poir.) Ruhl. or its var. *angustifolius* Mold.

Additional citations: COLOMBIA: Meta: Cuatrecasas 7886 (N). BRAZIL: Distrito Federal: *Heringer*, *Filgueiras*, *Mendonça*, & *Per-eira* 7420 (N). Matto Grosso: *Harley*, *Souza*, & *Ferreira* 10405 (N); *Ramos* & *Sousa* 127 (N). Minas Gerais: *Macedo* 2853 (N); *Mello Barreto* 2585 [Herb. Jard. Bot. Belo Horiz. 4795] (N); *Mendes Magalhães* 2091 [Herb. Jard. Bot. Belo Horiz. 42452] (N); *Oliveira* 67 [Herb. Jard. Bot. Belo Horiz. 32592] (N); *Vilaça* 192 [Ribeiro 199; Herb. FEEMA 21843] (Fe). Paraná: *Hatschbach* 22504 (N); *Kummrow* 2179 (Ld); *Mattos* 4288 (N), 4411 (N), 4657 (N); *Reitz & Klein* 17472 (N, W--2548329), 17620 (N); *Smith, Klein, & Hatschbach* 14549 (W--2573021); *Tessmann* 2746 (N), 3611 (N). Rio Grande do Sul: *Rambo* 30865 (N), 34675 (N), 34865 (N), 35244 (N). Santa Catarina: *Klein* 3470 (N); *Reitz & Klein* 6008 (W--2268658), 11593 (N), 16405 (N); *Smith & Klein* 8186 (W--2251355), 10653 (W--2251700), 13689 (W--2573024), 13762 (W--2573022), 14314 (W--2573023), 15502 (W--2653314). Sao Paulo: *Moldenke & Moldenke* 19671 (N); *Pickel* 5526 (N). State undetermined: *Riedel* 1480 (T). PARAGUAY: *Hassler* 1061 (N, N), 3645 (N), 6697 (N), 8483 (N), 12532 (N); *J. Jørgensen* 4174 (N).

SYNGONANTHUS CAULESCENS var. *HIRSUTUS* Mold., *Phytologia* 53: 367--368. 1983.

Bibliography: Mold., *Phytologia* 53: 367--368 (1983) and 54: 234. 1983.

Luteyn and his associates encountered this plant in wet dwarf forests, at 1310 m. altitude, in both flower and fruit in November. The collections cited below were previously regarded and distributed as typical *S. caulescens* (Poir.) Ruhl.

Citations: VENEZUELA: Bolívar: *Luteyn*, *Lebrón-Luteyn*, & *Steyermark* 6263 (W--2939059); *Maguire*, *Wurdack*, & *Bunting* 35909 (Ld--photo of type, W--2168964--type).

SYNGONANTHUS CAULESCENS var. *LONGIFOLIUS* Mold., *Phytologia* 51: 245. 1982.

Bibliography: Mold., *Phytologia* 51: 245 (1982) and 54: 234. 1983.

Delascio and his associates refer to this plant as having "hojas sublanosas grisáceas" and encountered the plant at 100 m. altitude, in both flower and fruit in December.

Citations: VENEZUELA: Guárico: *Delascio, Montes, & Davidse* 11436 (Ld). FRENCH GUIANA: *Cremers* 4833 (Cy--type).

SYNGONANTHUS CAULESCENS f. *LONGIPES* Mold.

Additional bibliography: Mold., Biol. Abstr. 61: 4884. 1976; Mold., Phytologia 37: 58. 1977; Hocking, Excerpt. Bot. A.31: 18. 1978; Mold., Phytol. Mem. 2: 164 & 621. 1980.

SYNGONANTHUS CAULESCENS var. *OBTUSIFOLIUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 421. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 358. 1928 (Ld, N, W).

SYNGONANTHUS CAULESCENS var. *PROCERUS* (Klotzsch) Mold.

Additional bibliography: Mold., Phytologia 35: 421--422. 1977; Mold., Phytol. Mem. 2: 119, 164, 401, 428, 443, & 621. 1980.

Recent collectors have found this plant in disturbed sandy wet places, in both flower and fruit in April, and describe the inflorescence heads as white.

Additional citations: BRAZIL: Distrito Federal: *Mendonça & Pereira* 180 (N).

SYNGONANTHUS CAULESCENS var. *PROLIFERUS* Mold.

Additional bibliography: Mold., Phytologia 42: 39. 1979; Angely, S. Am. Bot. Bibl. 2: 673. 1980; Mold., Phytol. Mem. 2: 164 & 621. 1980; Mold., Phytologia 54: 234 & 237. 1983.

Steyermark describes the leaves of this plant as long, narrow, and attenuate-acute, deep-green in color. He found it growing on wet rocks at the base of waterfalls and in cracks of granitic boulders by cascades, at 300--550 m. altitude, in both flower and fruit in April and July. His collections have hitherto been regarded as and distributed as typical *S. caulescens* (Poir.) Ruhl.

Additional citations: VENEZUELA: Bolívar: *J. A. Steyermark* 76055 (W--2407784), 95741 (W--2584707).

SYNGONANTHUS CENTAUROIDES (Bong.) Ruhl.

Additional bibliography: Mold., Phytologia 35: 423--425 (1977), 38: 31 & 44 (1977), and 38: 183 & 190. 1978; Mold., Phytol. Mem. 2: 164, 425, 498, & 621. 1980.

Recent collectors report this species common among grasses in "vegetação de catinga amazônica baixa".

Additional citations: BRAZIL: Mato Grosso: *Murça Pires & Santos* 16382 (N). MOUNTED CLIPPINGS: Bong., Ess. Monog. Erioc. 35. 1831 (Ld, N, W).

SYNGONANTHUS CENTAUROIDES var. *SUBAPPRESSUS* Ruhl.

Additional bibliography: Mold., Phytologia 35: 424--425. 1977; Mold., Phytol. Mem. 2: 164 & 621. 1980.

SYNGONANTHUS CENTAUROIDES var. *TERETIPES* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 425. 1977; Mold.,

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 395--396. 1928 (Ld, N, W).

SYNGONANTHUS CHAPADENSIS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 425 (1977) and 37: 86. 1977; Mold., Phytol. Mem. 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 330--331. 1928 (Ld, N, W).

SYNGONANTHUS CHRYSANTHUS (Bong.) Ruhl.

Additional bibliography: Mold., Phytologia 42: 39--40. 1979; Angely, S. Am. Bot. Bibl. 2: 678. 1980; Mold., Phytol. Mem. 2: 164, 402, 405, 443, & 622. 1980.

Additional citations: BRAZIL: Rio Grande do Sul: Vidal IV.339 [Herb. Mus. Nac. Rio Jan. 105081] (W--2653325), IV.481 [Herb. Mus. Nac. Rio Jan. 126557] (W--2653224). Santa Catarina: Reitz 4825 [Herb. Barb. Rod. 6345] (W--2321364), 5567 [Herb. Barb. Rod. 6338] (W--2321370); Smith & Reitz 5874 (W--2120178); Ule 1386 (W--2699217). MOUNTED ILLUSTRATIONS: Reitz, Fl. Ilust. Catar. I Erioc. 85. 1976 (Ld).

SYNGONANTHUS CHRYSANTHUS var. *CASTRENSIS* Mold.

Additional bibliography: Mold., Phytologia 42: 40. 1979; Angely, S. Am. Bot. Bibl. 2: 678. 1980; Mold., Phytol. Mem. 2: 164 & 622. 1980.

Additional citations: BRAZIL: Parana: Vidal III.74 [Araujo s. n.; Herb. Mus. Nac. Rio Jan. 77012] (W--2700822--fragment & photo of type).

SYNGONANTHUS CHRYSOLEPIS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 428. 1977; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43], 45--48, 53, & 58, fig. 71. 1979; Mold., Phytol. Mem. 2: 164 & 622. 1980.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 58, fig. 71. 1979.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 390--391, pl. 249. 1928 (Ld, N, W).

SYNGONANTHUS CILIATUS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 428--429. 1977; Mold., Phytol. Mem. 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 391--392, pl. 261. 1928 (Ld, N, W).

SYNGONANTHUS CIPOEENSIS Ruhl.

Additional bibliography: Mold., Phytologia 35: 429 & 443. 1977; Mold., Phytol. Mem. 2: 164, 443, & 622. 1980.

SYNGONANTHUS CIRCINNATUS (Bong.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 68. 1977; Hocking, Excerpt. Bot. A.31: 18. 1978; Mold., Phytol. Mem. 2: 164 &

622. 1980.

SYNGONANTHUS COMOSUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 42: 40. 1979; Mold., *Phytol. Mem.* 2: 119, 164, & 622. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 76. 1980.

SYNGONANTHUS COMOSUS var. *HARLEYI* Mold.

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 170. 1976; Mold., *Phytologia* 35: 431. 1977; Mold., *Phytol. Mem.* 2: 164. & 622. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 76. 1980.

Mori & Boom encountered this plant in wet areas of cerrado, in flower in June.

Additional citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15952 (W--2777071--isotype); Mori & Benton 13140 (Ld, N); Mori & Boom 14412 (Ld, N).

SYNGONANTHUS COMPACTUS Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 68 & 497. 1977; Mold., *Phytol. Mem.* 2: 135, 164, & 622. 1980.

Recent collectors describe this species as a very abundant small plant forming the ground cover in sandy soil of campina and found it in both flower and fruit in June.

Additional & emended citations: BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2691 (Ld, W--2931232); Ule 6175 [Macbride photos 10679] (Ld--photo of type).

SYNGONANTHUS COSTATUS Ruhl.

Additional bibliography: Mold., *Phytologia* 35: 432. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

SYNGONANTHUS COWANI Mold.

Additional bibliography: Mold., *Phytologia* 35: 432--433 (1977) and 44: 215--216. 1979; Mold., *Phytol. Mem.* 2: 111, 119, 443, & 622. 1980; Mold., *Phytologia* 51: 245 & 302. 1982.

Recent collectors refer to this plant as a frequent diminutive herb on wet open savannas, at 120 m. altitude, and have found it in flower in November and both in flower and fruit in February. Huber speaks of it as "Bastante común al borde de los pequeños montículos, hasta 6--7 cm de alto", the flowers white, at 100 m. altitude.

The Maguire, Cowan, & Wurdack 30780, Maguire & Wurdack 34532, and Maguire, Wurdack, & Bunting 36740, previously cited by me as typical *S. cowani*, are now regarded as representing its var. *tabulatus* Mold.

Additional citations: VENEZUELA: Amazonas: O. Huber 1635 (Ld), 4839 (Ld); Huber & Tillett 3000 (Ld); Maguire, Cowan, & Wurdack 30466 (W--2046498--isotype); Maguire & Wurdack 34569 (W--2168932); Maguire, Wurdack, & Bunting 36596a (W--2168979); Thomas & Rogers 2594 (N).

SYNGONANTHUS COWANI var. *INVOLUCRATUS* Mold., *Phytologia* 51: 302. 1982.

Bibliography: Mold., *Phytologia* 51: 302. 1982.

Citations: VENEZUELA: Amazonas: *O. Huber* 4844 (Ld--type).

SYNGONANTHUS COWANI var. *LONGIPEDUNCULATUS* Mold.

Additional bibliography: Mold., *Phytologia* 35: 433. 1977; Mold., *Phytol. Mem.* 2: 111 & 622. 1980.

Additional citations: COLOMBIA: Vaupés: *Maguire, Wurdack, & Bunting* 36290 (W--2168970--isotype).

SYNGONANTHUS COWANI var. *SIMPLEX* Mold., *Phytologia* 51: 245. 1982.

Bibliography: Mold., *Phytologia* 51: 245. 1982.

Citations: VENEZUELA: Amazonas: *O. Huber* 5096 (Ld--type).

SYNGONANTHUS COWANI var. *TABULATUS* Mold., *Phytologia* 44: 215--216. 1979.

Bibliography: Mold., *Phytologia* 44: 215--216. 1979; Mold., *Phytol. Mem.* 2: 119 & 622. 1980.

Collectors describe this plant as locally frequent, locally occasional, or even very common on open savannas, at 95--150 m. altitude, referring to it as an herb, 5--7 cm. tall, the inflorescence heads grayish-white, and the florets white, in both flower and fruit from January to March.

The material cited below was mostly previously regarded and cited as typical *S. cowani* Mold.

Citations: VENEZUELA: Amazonas: *O. Huber* 1684 (Ld--type), 3361 (Ld); *Huber & Medina* 5802 (Ld); *Huber & Tillett* 2791 (Ld), 2815 (Ld), 2915 (Ld), 3029, (Ld), 3067 (Ld); *Maguire, Cowan, & Wurdack* 30780 (N, W); *Maguire & Wurdack* 34532 (N, W--2168929); *Maguire, Wurdack, & Bunting* 37640 (N, W--2169001).

SYNGONANTHUS CRASSINERVIUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 433--434. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 345--346, pl. 219. 1928 (Ld, N, W).

SYNGONANTHUS CRASSINERVIUS var. *GLABRESCENS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 433--434. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

SYNGONANTHUS CRISPUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 434. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 358--359, pl. 226. 1928 (Ld, N, W).

SYNGONANTHUS CRISPUS var. *ITACAMBIRENSIS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 434. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 359.

1928 (Ld, N, W).

SYNGONANTHUS CURRALENSIS Mold.

Additional bibliography: Mold., *Phytologia* 35: 434. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 76. 1980; Hocking, *Excerpt. Bot. A.36*: 23. 1981; Mold., *Phytologia* 50: 215, 248, & 270. 1982.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16661 (W--2777067--isotype). MOUNTED ILLUSTRATIONS: Mold., *Phytologia* 31: 488. 1975 (Ld).

SYNGONANTHUS CURRALENSIS var. *HARLEYI* Mold., *Phytologia* 43: 356. 1979.

Bibliography: Mold., *Phytologia* 43: 356. 1979; Mold., *Phytol. Mem.* 2: 164 & 622. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 76. 1980; Hocking, *Excerpt. Bot. A.36*: 23. 1981.

The original collectors of this plant describe it as a rosette herb with rigid gray leaves and gray scapes [peduncles] to 25 cm. tall and the involucre bractlets "palest-brown". They have found it growing at 1000 m. altitude, in both flower and fruit in March.

Citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19306 (N--isotype).

SYNGONANTHUS CURRALENSIS var. *PAUCIFOLIUS* Mold., *Phytologia* 50: 215. 1982.

Bibliography: Mold., *Phytologia* 50: 215, 248, & 270. 1982.

Mori & Boom have encountered this plant in dry sandy soil on campo rupestre, at 1000 m. altitude, in both flower and fruit in June.

Citations: BRAZIL: Bahia: Mori & Boom 14471 (Ld, N), 14548 (Ld--type, N--isotype).

SYNGONANTHUS DEALBATUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 434--435. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 385--386, pl. 245. 1928 (Ld, N, W).

SYNGONANTHUS DEALBATUS var. *MINOR* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 435. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 386. 1928 (Ld, N, W).

SYNGONANTHUS DECORUS Mold.

Additional bibliography: Mold., *Phytologia* 37: 68. 1977; Mold., *Phytol. Mem.* 2: 164 & 622. 1980.

Additional citations: MOUNTED ILLUSTRATIONS: Mold., *Phytologia* 32: 486, fig. 2. 1976 (Ld)

SYNGONANTHUS DENSIFLORUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 40. 1979;

Mold., Phytol. Mem. 2: 165, 175, 443, & 622. 1980; Mold., Phytologia 48: 291 (1981), 50: 248 & 270 (1982), and 55: 43. 1984.

Hatschbach found this plant growing in brejo (sedge meadow).

Additional citations: BRAZIL: Goiás: Hatschbach 43803 (Ld, W--2932036); Irwin, Maxwell, & Wasshausen 21414 (W--2570160A). Minas Gerais: Macedo 1835 (W--2196717).

SYNGONANTHUS DENSIFLORUS var. *BREVIPIES* Mold., Phytologia 55: 43. 1984.

Bibliography: Mold., Phytologia 55: 43. 1984.

Citations: BRAZIL: Distrito Federal: Héninger, Filgueiras, Mendonça, & Pereira 7488 (N--type).

SYNGONANTHUS DENSIFLORUS var. *GLABRESCENS* Mold.

Additional bibliography: Mold., Phytologia 35: 437--438. 1977; Mold., Phytol. Mem. 2: 165, 175, 443, & 622. 1980.

Additional citations: BRAZIL: Mato Grosso: Irwin, Souza, Gear, & Santos 17022 (W--2709899--isotype).

SYNGONANTHUS DENSIFLORUS var. *GLABRIFOLIUS* Mold.

Additional bibliography: Mold., Phytologia 42: 40. 1979; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: BRAZIL: Goiás: Irwin, Anderson, Stieber, & Lee 34606 (W--2709901--isotype).

SYNGONANTHUS DENSIFLORUS var. *LONGIFOLIUS* Mold., Phytologia 48: 291. 1981.

Bibliography: Mold., Phytologia 48: 291 (1981) and 50: 248 & 270. 1982.

Citations: BRAZIL: Pará: Plowman, Davidse, Rosa, Rosário, & Santos 9090 (Ld--type, N--isotype).

SYNGONANTHUS DENSIFOLIUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 68. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980; Mold., Phytologia 48: 291 (1981) and 50: 245 & 270. 1982.

King & Bishop found this plant locally abundant on sandy flats, at 3300--3800 feet altitude, in flower in February, describing the inflorescence heads as white.

Additional citations: BRAZIL: Goiás: Irwin, Santos, Souza, & Fonsêca 24648 (W--2582510A); King & Bishop 8900 (W--2922394). MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., 1: 319--320, pl. 203. 1928 (Ld, N, W).

SYNGONANTHUS DENSIFOLIUS var. *MAJUS* Mold.

Additional bibliography: Mold., Phytologia 35: 439. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32982 (W--2709605--isotype).

SYNGONANTHUS DENSIFOLIUS var. *PILOSIOR* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 439--440. 1977;

Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 320—321. 1928 (Ld, N, W); Dawson, Los Angeles Co. Mus. Contrib. Sci. 7: 5, fig. 1 right. 1957 (Ld, W).

SYNGONANTHUS DENSIFOLIUS var. *VENEZUELENSIS* Mold., Phytologia 48: 291. 1981.

Bibliography: Mold., Phytologia 48: 291 (1981) and 50: 245 & 270. 1982.

Calderón and his associates describe this plant as growing to 30 cm. tall, with "large white inflorescences", and found it common in white sand campina, in both flower and fruit in June.

Citations: VENEZUELA: Amazonas: Huber & Tillett 2918 (Ld--type). BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2580 (Ld, W--2931235).

SYNGONANTHUS DENSUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 42:40. 1979; Mold., Phytol. Mem. 2: 119, 165, & 622. 1980; Mold., Phytologia 53: 264 (1983) and 54: 234. 1983.

Recent collectors describe this plant as a tufted herb. the inflorescence heads cream-color or white. They have found it growing in wet sandy soil, on sandy campo, in restinga and campo rupestre, and on open campina, in both flower and fruit in March, June, and December. Davidson & Martinelli encountered it in "open places in hot white sand among low restinga vegetation surrounded by mata alta on terra firme".

Material of *S. densus* has been misidentified and distributed in some herbaria as *Eriocaulon* sp. and the Maguire 33231 collection, cited below, was previously incorrectly reported by me as the very closely related *S. pakaraimensis* Mold.

Additional citations: VENEZUELA: Bolívar: B. Maguire 33231 (N, W--2168902). BRAZIL: Amazonas: A. B. Anderson 308 (N); Ongley & Ramos P.21771 (N, W--2935294); Plowman, Davis, & Nelson 12657 (N); Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17932 (W--2772582); Prance, Coêlho, Harley, Kubitzki, Maas, Sastre, & Smith 11688 (W--2801673); Prance, Coêlho, & Monteiro 14843 (W--2801669); Prance, Philcox, Rodrigues, Ramos, & Farías 5144 (W--2573049A); Prance, Ramos, Farías, & Philcox 4834 (W--2570375A). Bahia: Brito & Vinha 106 (Ld). Goiás: W. R. Anderson 8220 (W--2755405); Hatschbach 4371 (Ld), 43710 (W--2932033); Pereira 23 (W--2951310). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22552 (Ld, N, W--2952976); Cid, Ramos, & Mota 1218 [Herb. Inst. Nac. Pesq. Amaz. 94437] (Ld, N); Davidson & Martinelli CD.10619 (Ld).

SYNGONANTHUS DENSUS var. *PUMILUS* Mold.

Additional bibliography: Mold., Phytologia 35: 441. 1977; Mold., Phytol. Mem. 2: 119, 165, & 622. 1980.

Liesner found this plant growing in white sand podzolic soil in scrubby forests, at 120 m. altitude, fruiting in November.

Additional citations: VENEZUELA: Amazonas: Liesner 3914 (Ld).

SYNGONANTHUS DIAMANTINENSIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 441. 1977; Mold., *Phytol. Mem.* 2: 165, 443, & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 315--317, pl. 20C. 1928 (Ld, N, W).

SYNGONANTHUS DROUETII L. B. Sm.

Additional bibliography: Mold., *Phytologia* 42: 42. 1979; Mold., *Phytol. Mem.* 2: 119, 165, 425, & 622. 1980; Mold., *Phytologia* 54: 68. 1983.

Recent collectors describe this plant as 7 cm. tall, with cream-colored inflorescence heads, and have found it growing on dry campina and commonly on open white sand campinas, in fruit in October and both in flower and fruit in August.

The *Cid, Buck, Nelson, Almeida, Mota, & Lima* 524 collection, cited below, was previously mistakenly regarded as *S. elegans* var. *elanatus* Ruhl.

Additional citations: BRAZIL: Amazonas: *Cid, Buck, Nelson, Almeida, Mota, & Lima* 267 (Ld, N), 524 (N). Pará: *W. R. Anderson* 10929 (W--2755404); *Daly, Callejas, Silva, Taylor, Rosário, & Santos* 858 (Ld); *Drouet* 2112 (W--1673749--isotype).

SYNGONANTHUS DROUETII var. *PARVICEPS* Mold., *Phytologia* 54: 68. 1983.

Bibliography: Mold., *Phytologia* 54: 68. 1983.

Collectors have encountered this plant on wet savannas, in both flower and fruit in November.

Citations: VENEZUELA: Amazonas: *W. W. Thomas* 2638 (Ld--type); *Thomas & Rogers* 2609 (N).

SYNGONANTHUS DUIDAE Mold.

Additional bibliography: Mold., *Phytologia* 35: 442--443. 1977; Mold., *Phytol. Mem.* 2: 119 & 622. 1980; Mold., *Phytologia* 51: 245 & 302 (1982) and 54: 139. 1983.

Recent collectors refer to this plant as a colonial herb, 10--15 cm. tall, with rich-green leaves and white inflorescence heads, "forming tufts of several plants" and frequent in open spaces on savannas. at 1100--2100 m. altitude, in both flower and fruit in January, February, and October.

Additional citations: VENEZUELA: Amazonas: *Farinas, Velasquez, & Medina* 364 (N); *O. Huber* 4275 (Ld); *Steyermark, Brewer-Carías, & Liesner* 124528 (E--2901869, N); *Steyermark, Guariglia, Holmgren, Luteyn, & Mori* 126395 (Ld). MOUNTED CLIPPINGS: Mold., *Fieldiana Bot.* 28: 127--128, 1951 (W).

SYNGONANTHUS DUIDAE var. *LONGIFOLIUS* Mold., *Phytologia* 51: 245. 1982.

Bibliography: Mold., *Phytologia* 51: 245 & 302 (1982) and 54: 139. 1983.

By error, this taxon was republished by me in 1983, but based on the same type collection, a collection which previously had been regarded mistakenly as representing *Leiothrix steyermarkii* Mold.

Citations: VENEZUELA: Bolívar: *Koyama & Agostini 7515* (N--type).

SYNGONANTHUS EBURNEUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 35: 443--444. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980; Mold. in *Harley & Mayo, Toward Checklist Fl. Bahia* 76. 1980.

Additional citations: BRAZIL: Bahia: *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 17149* (W--2791568).

SYNGONANTHUS EGLERI Mold.

Additional bibliography: Mold., *Phytologia* 35: 444. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980; Mold., *Phytologia* 52: 131. 1982.

SYNGONANTHUS EGLERI var. *POMBOSENSIS* Mold., *Phytologia* 52: 131. 1982.

Bibliography: Mold., *Phytologia* 52: 122 & 131. 1982.

Citations: BRAZIL: Amazonas: *Calderón, Monteiro, & Guedes 2608* (Ld--type, W--2931238--isotype, W--2931239--isotype).

SYNGONANTHUS ELEGANS (Bong.) Ruhl.

Additional bibliography: Cronquist, *How Know Seed Pl.* 124--125, fig. 265. 1979; Mold., *Phytologia* 42: 40. 1979; Monteiro, *Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo* 7: [43], 45--47, & 53. 1979; Mold., *Phytol. Mem.* 2: 165, 361, & 622. 1980; Mold., *Phytologia* 54: 237. 1983.

Additional illustrations: Cronquist, *How Know Seed Pl.* fig. 265. 1979.

The *Cid, Buck, Nelson, Almeida, Mota, & Lima 524* collection, distributed as *S. elegans*, actually proves to be *S. drouetii* L. B. Sm., an Amazonian species.

Additional citations: BRAZIL: Minas Gerais: *Maguire, Mendes Magalhães, & Maguire 49135* (W--2435298). MOUNTED CLIPPINGS & ILLUSTRATIONS: *Abbiatti, Rev. Mus. La Plata, ser. 2, 6: 337. 1946* (Ld); *Forstner, Verhandl. Zool. Bot. Gesel. Wien* 112: 90. 1972 (Ld); *Kunth, Enum. Pl.* 3: 526--527 & 579. 1841 (Ld, N, W).

SYNGONANTHUS ELEGANS var. *CANESCENS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 446--447. 1977; Monteiro, *Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo* 7: [43], 45--47, & 53. 1979; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 365. 1928 (Ld, N, W).

SYNGONANTHUS ELEGANS var. *ELANATUS* Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 68, 69, 487, & 488 (1977) and 38: 27. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Recent collectors have encountered this plant on sandy campos and campinas, as well as in sandy soil of campo cerrado, in both flower and fruit in January, March, and August.

The *Cid & al. 524*, distributed as this taxon, is *S. drouetii*.

Additional citations: BRAZIL: Goiás: *Hatschbach* 42136 (Ld, N). Minas Gerais: *Hatschbach* 40827 (Ld, N, W--2850782); *Irwin, Santos, Souza, & Fonsêca* 22019 (W--2582563A).

SYNGONANTHUS ELEGANTULUS Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 40--41. 1979; Mold., *Phytol. Mem.* 2: 165 & 622. 1980; Mold. in *Harley & Mayo, Toward Checklist Fl. Bahia* 77. 1980; Mold., *Phytologia* 52: 232 (1982) and 54: 237. 1983.

Recent collectors describe this plant as a wiry-scaped herb, to 20 cm. tall, with gray leaves, pale-brown involucre bractlets, and white florets. They have found it growing on natural campos and in marshes on the "lower slopes of sandstone, metamorphic, and quartzite rock outcrops with associated marsh and damp flushes", at 1500 m. altitude, in fruit in March and September.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley* 19774 (Ld, N, W--2936300); *Santos, Mori, & Mattos Silva* 3356 (Ld). Minas Gerais: *Hatschbach* 41373 (N, W--2840051); *Irwin, Harley, & Onishi* 29129 (W--2709602). Rio de Janeiro: *Araujo & Maciel* 3538 [*Herb. FEFMA* 16181] (Ld).

SYNGONANTHUS ELEGANTULUS var. *GLABRIFOLIUS* Mold., *Phytologia* 52: 232. 1982.

Bibliography: Mold., *Phytologia* 52: 232 (1982) and 54: 237. 1983.

Citations: BRAZIL: Amazonas: *Calderón, Monteiro, & Guedes* 2564 (Ld--type, W--2931220--isotype, W--2931222--isotype).

SYNGONANTHUS ELEGANTULUS var. *GLAZIOVII* Mold.

Additional bibliography: Mold., *Biol. Abstr.* 64: 5384. 1977; Mold., *Phytologia* 37: 68 & 69. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Recent collectors have encountered this plant on campo rupestre, at 1000 m. altitude, in both flower and fruit in July.

Additional citations: BRAZIL: Bahia: *Mori, King, Santos, & Hage* 12415 (Ld, W--2854269).

SYNGONANTHUS ENSIFOLIUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 449. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 383--385, pl. 244. 1928 (Ld, N, W).

SYNGONANTHUS ERECTIFOLIUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 449--450 (1977) and 38: 126. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: 365--366, pl. 231. 1928 (Ld, N, W).

SYNGONANTHUS ERIOPUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 35: 450. 1977; Mold., *Phytol. Mem.* 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 362--363, pl. 229. 1928 (Ld, N, W).

SYNGONANTHUS ERIOPUS var. *APPRESSUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 450. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 363. 1928 (Ld, N, W).

SYNGONANTHUS EUSCHEMUS Ruhl.

Additional bibliography: Mold., Phytologia 35: 450--451. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: BRAZIL: Goiás: W. R. Anderson 8039 (W--2755403); Irwin, Grear, Souza, & Reis dos Santos 13298 (W--2861729).

SYNGONANTHUS FERRENSIS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 451--452 (1977) and 37: 96, 494, & 495. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 355--356, pl. 225. 1928 (Ld, N, W).

SYNGONANTHUS FERTILIS (Körn.) Ruhl.

Additional synonymy: *Syngonanthus humboldtii* var. *elongatus* Mold. in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 180. 1927; Mold., Phytologia 4: 321 (1953) and 37: 90. 1977; Hocking, Excerpt. Bot. A.33: 5 & 165. 1979; Mold., Phytologia 42: 38 & 41 (1979) and 47: 17. 1980; Mold., Phytol. Mem. 2: 111, 119, 125, 165, 443, 622, & 627. 1980; Mold., Phytologia 50: 245 & 262 (1982), 52: 19 (1982), and 54: 234 & 235. 1983.

Recent collectors describe this plant as a frequent or abundant herb, 20--30 cm. tall, with white "sunburst" inflorescences. They have found it growing on savannas and sabanitas, in wet situations generally, or wet or open wet grass-savannas on sandstone, in open grassy seepage areas, in temporarily dry creek beds and on periodically flooded savannas, on quartzite rock outcrops, in sandy soil with cerrado, in the transition zone from fine white sand to moist fine sand and clay, abundant in morichal, on "savana entre morros de pedra", "en la sabana y en pequeños charcos", in periodically burned cerrado, among sandstone rocks in typical cerrado vegetation, and scattered in open wet sand with *Bulbostylis*, at 90--1300 m. altitude, in flower from October to June, in fruit in January and November, and both in flower and fruit in February, August, and October. Maguire refers to it as an infrequent to common annual of damp sandy places on savannas, while Davidse calls it "a moss-like plant with large umbels of globose inflorescences with white flowers, on savannas with scattered trees including *Curatella* and with many large outcropping dark-colored boulders".

Knuth (1927) cites Gaillard 174 from Bolívar, Venezuela. A vernacular name recorded for the species in Surinam is "tūrepan-aim8".

Material of typical *S. fertilis* has been misidentified, distributed in some herbaria, and even cited by me in previous installments of these notes as *S. humboldtii* (Kunth) Ruhl. and *S. humboldtii* var. *glandulosus* Gleason. On the other hand, the Bastos & al. 101 and Duke 12025, distributed and cited by me as *S. fertilis*, actually are *S. bellus* Mold., while Agostini 256 & 348, Maguire 33698, Maguire, Wurdack, & Bunting 36389, and Steyermark & Wurdack 21 are *S. fertilis* var. *orinocensis* (Mold.) Mold., and Kuhlmann 1630 is *S. humboldtii* (Kunth) Ruhl.

Additional & emended citations: VENEZUELA: Amazonas: Davidse 2752 (Ld, N); O. Huber 466 (Ld, N), 1881 (Ld); Huber & Tillett 3033 (Ld); Huber, Tillett, & Davidse 3769 (Ld); Maguire, Cowan, & Wurdack 30558 (N, Ve); Maguire, Wurdack, & Maguire 41658 (N, S, W--2279295); Phelps & Hitchcock 460 (N); Steyermark & Redmond 112801a (N); Thomas & Rogers 2593 (N). Bolívar: Huber, Alarcon, & Barreat 6726 (Ld); Koyama & Agostini 7273 (N, S, W--2575528A); Lasser 1762 (N); B. Maguire 33698 (N), 33699 (N); J. A. Steyermark 94182 (Lw, Mu, N, W--2584280); Vareschi & Foldats 4629 (N); Wurdack & Monachino 39948 (Mu, N, S, S). SURINAM: Oldenburger, Norde, & Schulz ON.558 (N). BRAZIL: Amazonas: Prance, Maas, Woolcott, Monteiro, & Ramos 16185 (Ld, Mu, N, W--2759068); Rosa & Lira 2257 (N). Goiás: W. R. Anderson 10018 (N, W--2927286); Haas, Haas, & Belem 303 [Herb. Brad. 50344] Mato Grosso: Malme 3342 (N); Murça Pires & Santos 16317 (N); Rosa & Santos 1954 (N, W--2934337). Pará: Murça Pires 16068 (N, N); Murça Pires, Black, Wurdack, & Silva 6078 (N); 6188 (N); Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Reis dos Santos P.25188 (N, N, W--2868545), P.25247 (N, N, W--2868552). Piauí: G. Gardner 2960 (W--936272--cotype). Rondônia: Rosa, Murça Pires, & Rodrigues 894 (N).

SYNGONANTHUS FERTILIS var. *FUSCUS* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 5 & 165. 1979; Mold., Phytologia 42: 41. 1979; Mold., Phytol. Mem. 2: 111, 165, 622, & 627. 1980; Mold., Phytologia 50: 245. 1982.

Recent collectors describe this plant as an herb, 20 cm. tall, the inflorescence heads light-gray, and the flowers white. They have found it locally abundant in wet sandy areas of savannas, in shallow pools in rocky riverbeds, and in wet sand of ditches on exposed sandstone shields, at 200--1200 m. altitude, in flower in January, March, August, and September.

Material of this variety has been misidentified, distributed in some herbaria, and even cited by me in previous installments of these notes as *S. humboldtii* (Kunth) Ruhl. and *S. humboldtii* var. *glandulosus* Gleason.

Additional & emended citations: COLOMBIA: Vaupés: Zarucchi 1998 (N, W--2832341). VENEZUELA: Amazonas: Cardenas & Pyykkö 1395 (Ld); O. Huber 3192 (Lc), 3450 (Lc); Huber & Tillett 2993

(Ld); J. A. Steyermark 57857 (N). Bolívar: Koyama & Agostini 7351 (N, S), 7516 (Ld, N), 7528 (N).

SYNGONANTHUS FERTILIS var. *GLANDULOSUS* (Gleason) Mold., Phytol. Mem. 2: 111, 443, & 622 hyponym. 1980; comb. nov.

Synonymy: *Syngonanthus humboldtii* var. *glandulosus* Gleason, Bull. Torrey Bot. Club 57: 327. 1931. *Syngonanthus bolboldtii* var. *glandulosus* Gleason ex Mold. in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101 sphalm. 1953.

Bibliography: Gleason, Bull. Torrey Bot. Club 58: 327. 1931; Fedde & Schust., Justs Bot. Jahresber. 59 (2): 20. 1939; Mold. in Gleason & Killip, Brittonia 3: 159. 1939; Mold., Alph. List Cit. 1: 92. 1946; Mold., Known Geogr. Distrib. Erioc. 6. 1946; Mold., Alph. List Cit. 2: 557 (1948), 3: 975 (1949), and 4: 985. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 65 & 213. 1949; Mold. in Maguire & al., Mem. N. Y. Bot. Gard. 8: 101. 1953; Mold., Phytologia 4: 321. 1953; Mold., Résumé 69, 73, & 492. 1959; Mold., Fifth Summ. 1: 120 & 129 (1971) and 2: 963. 1971; Mold., Phytologia 23: 418. 1972; J. A. Steyermark, Biotropica 6: 10. 1974; J. A. Steyermark, Act. Bot. Venez. 10: 226 & 232. 1975; Mold., Phytologia 34: 277 (1976), 36: 35 & 65 (1977), 37: 90--92 (1977), and 42: 200--201. 1979; Mold., Phytol. Mem. 2: 111, 443, & 622. 1980; Mold., Phytologia 54: 145 & 235. 1983.

Recent collectors have found this plant growing on savannas and especially in wet areas in savannas, "in sandy areas in low forested region around ponds", and on "campinas sobre pedra de arenito", at 60--65 m. altitude, describing the flowering heads as white. They have found it in flower and fruit in February, March, June, and August. Other descriptions, habitat notes, flowering and fruiting months, etc., have been recorded in Phytologia 37: 91 (1977) and 42: 200--201 (1979), which see.

Material of this taxon has been misidentified and distributed in some herbaria as *Paepalanthus* sp. On the other hand, the Tate 1308, distributed as this var. *glandulosus*, actually is *S. bel-lus* Mold., while Anderson 10018, Haas, Haas, & Belém 303, Huber 466, Koyama & Agostini 7273, Maguire 33698 & 33699, Maguire, Wurdack, & Bunting 36389, Maguire, Wurdack, & Maguire 14658, Murça Pires 16068, Prance & al. 16185, P.25188, & P.25247, Rosa & al. 894, Steyermark 94182, Steyermark & Redmond 112801a, and Steyermark & Wurdack 21 are typical *S. fertilis* (Körn.) Ruhl., Koyama & Agostini 7351, 7516, & 7528 and Steyermark 57857 are *S. fertilis* var. *fuscus* Mold., and Foldats 3536, Holt & Gehriger 234, Maguire & al. 30985, and Steyermark 75264 are *S. humboldtii* (Kunth) Ruhl.

Additional & emended citations: COLOMBIA: Vaupés: García Barriga & Jaramillo Mejia 17119 in part (W-2569463A), Schultes, Baker, & Cabrera 18230 (Ss, W--2198897), 18534 (Ss, W--2172194). VENEZUELA: Amazonas: J. A. Steyermark 57857 (N, S, W--1901747), 105144 (Ac); Steyermark & Bunting 102661 (Ft); G. H. H. Tate 315 (N--type, W--1498483--isotype). Apure: Davidse & González 12336 (Ld), 13907 (Ld), 14697 (Ld). Bolívar: Cardona 267 (Ve); Hamann 2902 (Hm), 2903 (Hm), 2904 (Hm); Herter & Oberwinkler 16225 (Hu);

Killip 37355 (Ve); Schacht s.n. [Canaima, Januar 1937] (Mu); Vareschi & Foldats 4576 (Ve--40470); Vareschi & Magdefrau 6957 (Ve--42506). Guarico: Tamayo 3998 (W--2195276). State undetermined: Herb. Nac. Venez s.n. (Ve). BRAZIL: Goiás: Hatschbach 40136 (Ld, W--2850781). Mato Grosso: Cordeiro 31 in part (Ld). Rondônia: Ribeiro 1103 [Herb. IPEAN 149794] (Ld); Rosa, Murça Pires, & Rodrigues 891 (N).

SYNGONANTHUS FERTILIS var. *HIRTELLUS* Mold., Phytologia 52: 19. 1982.

Bibliography: Mold., Phytologia 52: 19. 1982.

Collectors describe this plant as having "golden" inflorescence heads and have encountered it in white sand campinas, in flower in June.

Citations: BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2590 (Ld, W--2931237), 2748 (Ld--type, W--2931228--isotype, W--2970398--isotype).

SYNGONANTHUS FERTILIS var. *HUBERI* Mold., Phytologia 47: 17. 1980.

Bibliography: Mold., Phytologia 47: 17. 1980; Mold., Phytol. Mem. 2: 622 & 627. 1980; Mold., Phytologia 50: 245. 1982.

Citations: VENEZUELA: Amazonas: O. Huber 2349 (Ld--type).

SYNGONANTHUS FERTILIS var. *ORINOCENSIS* (Mold.) Mold., Phytol. Mem. 2: 443, 622, & 627 hyponym. 1980; comb. nov.

Synonymy: *Syngonanthus humboldtii* var. *orinocensis* Mold. in Maguire & al., Mem. N. Y. Bot. Gard. 8: 102. 1953.

Bibliography: Mold. in Maguire & al., Mem. N. Y. Bot. Gard. 8: 102. 1953; Mold., Phytologia 4: 322. 1953; Mold., Résumé 73 & 492. 1959; Mold., Fifth Summ. 1: 127 (1971) and 2: 963. 1971; Mold., Phytologia 37: 92--93. 1977; 443, 622, & 627. 1980; Mold., Phytologia 50: 245. 1982.

Collectors have found this plant growing on savannas and in morichal, on riverbanks, and as "a common annual herb of damp sandy places on savannas", at 120--1300 m. altitude, in both flower and fruit in January and February and in fruit also in November. They have described the inflorescence heads as whitish. Maguire and his associates refer to it as "locally abundant".

The collections cited below have previously been confused with and cited as typical *S. fertilis* (Körn.) Ruhl., from which the variety is easily distinguished by its large basal leaves.

Additional & emended citations: VENEZUELA: Amazonas: O. Huber 2621 (Ve), 3240 (Lc); Maguire, Wurdack, & Bunting 36389 (N, W--2168974); Phelps & Hitchcock s.n. (N). Bolívar: Agostini 256 (Ld, N, N, Ut--332854B), 348 (Lw, N, N, Ut--3328564B, W--2481636); B. Maguire 33698 (N); Steyermark & Wurdack 21 (Mu, N, N, W--2168498, W--2407711).

SYNGONANTHUS FILIPES Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 453. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv.

Silv., Fl. Mont. 1: 323--324, pl. 205. 1928 (Ld, N, W).

SYNGONANTHUS FISCHERIANUS (Bong.) Ruhl.

Additional synonymy: *Syngonanthus fischerianum* (Bong.) Ruhl. ex Mold., Phytologia 54: 244 in syn. 1983.

Additional bibliography: Mold., Phytologia 42: 41. 1979; Mold., Phytol. Mem. 2: 165, 402, 425, 428, 443, & 622. 1980; Mold., Phytologia 54: 244. 1983.

Recent collectors have encountered this plant in brejo, in both flower and fruit in January.

The Stawarski collection, cited below, is a mixture with *S. caulescens* (Poir.) Ruhl.

Additional citations: BRAZIL: Paraná: *Hatschbach* 43215 (Ld, W--2931978); *Hatschbach, Smith, & Klein* 28247 (W--265338); *Kuniyoshi & Kummrow* 4604 (Ld); *Stawiarski* s.n. [Herb. Mus. Nac. Rio Jan. 126560] in part (W--2653331). Santa Catarina: *Klein* 3612 (N); *Mello Filho* 682 [Herb. Mus. Nac. Rio Jan. 49607] (W--2653326); *F. Müller* 36 (W--2700820, W--photo); *Reitz & Klein* 6104 (W--2268737); *Smith & Klein* 8260 (W--2251367), 8536 (W--2251408), 13451 (W--2573031), 13685 (W--2573035), 15476 (W--2653313); *Smith & Reitz* 8707 (W--2251429). São Paulo: *Bailey & Bailey* 850 (Ba). MOUNTED CLIPPINGS: C. Diogo, Bol. Mus. Nac. Rio Jan. 1: 28--29. 1923 (W).

SYNGONANTHUS FLAVICEPS Alv. Silv.

Additional bibliography: Mold., Phytologia 35: 456--457 (1977) and 37: 256. 1977; Mold., Phytol. Mem. 2: 165 & 622. 1980.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Alv. Silv., Fl. Mont. 1: 328--330, pl. 209. 1928 (Ld, N, W).

SYNGONANTHUS FLAVIDULUS (Michx.) Ruhl.

Additional synonymy: *Syngonanthus flavidulus* "(Michx.) Ruhl. in Engl." apud Kral in Godfrey & Wooten, Aquat. Wetl. Pl. Southeast. U. S. 529. 1979.

Additional bibliography: Raf., Autikon Bot., imp. 2, 189. 1943; Raf., Atl. Journ., imp. 2, 1: 121. 1946; Lawrence, Taxon. Vasc. Pl., imp. 1, 405 (1951) and imp. 2, 405. 1971; Hocking, Excerpt. Bot. A.31: 17. 1978; Monteiro-Scanavacca & Mazzoni, Revist. Bras. Bot. 1: [59]. 1978; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. Southeast. U. S. 520, 529, & 530, fig. 307. 1979; Mold., Phytologia 42: 41--42. 1979; Pursh, Fl. Amer. Sept., imp. 2 [ed. Ewan], 92. 1979; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 197. 1980; Mold., Phytol. Mem. 2: 16, 18, 20, 24--26, 443, & 623. 1980; Mold., Phytologia 50: 234 (1982) and 52: 111 & 112. 1982; Wunderlin, Guide Vasc. Pl. Cent. Fla. 126. 1982; Mold., Phytologia 53: 320 (1983) and 54: 122. 1983.

Additional illustrations: Lawrence, Taxon. Vasc. Pl., imp. 1, 405 (1951) and imp. 2, 405. 1971; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. Southeast. U. S. 530, fig. 307. 1979.

Wunderlin (1982) describes this species as common in wet pine-lands and at the margins of ponds throughout Florida, flowering there in the spring.

It is of interest to note how Rafinesque (1832, 1840) separated his *Eriocaulon spathaceum* and his *E. flavidulum* var. *cinereum*. For *E. flavidulum* he says merely "New Jersey to Carol." and for its var. *cinereum* Raf. "Florida, Alabama, leaves broadly subulate 2 inches, scape 3 to 4, fl. dark gray, bracts greenish". For *E. spathaceum* Raf. he says "Leaves subulate very short, scape round hardly striate, base spathaceous, spathe bivalve obtuse subequal membranaceous. Capitula spherical white, scales ovate oblong obtuse. -- From Florida, seen in the herbarium of Mr. Halsey without a name. Scape one foot high."

Recent collectors have encountered *Syngonanthus flavidulus* in "moist sandy areas growing sympatrically with *Eriocaulon compressum*", "abundant on low roadsides with *Eriocaulon*", "in sandy peat at the edge of cypress titi", "in sandy soil of open roadsides", "in moist sandy soil at edge of pinelands", "in large clumps in shady wet soil of drying roadside ditches", and "in open woods associated with *Pinus clausa*, *Quercus myrtifolia*, *Q. geminata*, *Polygonella polygama*, and *Ceratiola ericoides*", describing the inflorescence heads as white. They have found it both in flower and fruit in April and May.

Material of *S. flavidulus* has been misidentified and distributed in some herbaria as *Eriocaulon* sp., *E. lineare* Small, and *Lachnocaulon glabrum* Körn. On the other hand, the Perdue 1765, distributed as *S. flavidulus*, actually is *Lachnocaulon anceps* f. *glabrescens* Mold.

Additional citations: NORTH CAROLINA: Bladen Co.: Biltmore Herb. 3162 (W--963199). Brunswick Co.: Massey & Massey 3284 (Ne--119181). SOUTH CAROLINA: Lexington Co.: McGregor 257 (W--982684). GEORGIA: Berrien Co.: R. Kral 24254 (W--2470362). Brantley Co.: Thorne & Muenscher 8829 (It). Charlton Co.: Spury 607 (W--1467230). Clinch Co.: R. Kral 24288 (W--2470348). Cook Co.: R. Kral 24238 (Mi). Early Co.: Thorne 4963 (It, W--2005955). Effingham Co.: R. Kral 24103 (W--2470430). Emanuel Co.: R. M. Harper 803 (W--400278). Lanier Co.: R. Kral 24265 (W--2470421). Liberty Co.: R. Kral 24217 (W--2470353). Miller Co.: Thorne 4194 (It). Screven Co.: R. Kral 24028 (W--2470413), 24051 (W--2470414). Tift Co.: Stuckey s.n. [August 18, 1933] (It). Ware Co.: F. Kral 25307 (W--2470405). Wayne Co.: Kral 24184 (W--2470377), 24198 (W--2470364). Billy's Island: Wright & Harper 126 (It). Chesser Island: Wright & Harper 128 (It). Floyd's Island: Wright & Harper 127 (It). FLORIDA: Alachua Co.: S. Knight s.n. [March '83] (W--310610). Bradford Co.: M. Cruz 192 (Ne--112831). Clay Co.: Canby s.n. [Hibernia, March 1869] (W--45353, W--45354); Thomas & Marx 37863 (Ne--115818). Collier Co.: West, Arnold, & Cooley s.n. [15 Apr. 1954] (W--2230994); Wiegand & Wiegand 220 (It). Dade Co.: Garber s.n. [June 1877] (W--45356). Duval Co.: Clausen & Trapido 3290 (It); Curtiss 3020 (It, W--82610, W--784521, W--936251), 4140 (W--218359), 4786 (It, W--963198, W--224478); Fredholm 5175 (W--717135); Lighthipe 452 (W--963194), s.n. [April 13, '97] (W--963197). Franklin Co.: Chapman, Biltmore Herb. 3162a (W--335154, W--963200); Vasey s.n. [1892] (W--45355). Gilchrist Co.: Correll & Correll 51693 (N, W--2995560). Highlands Co.:

Brass 14609 (W--2065081), 14658 (W--2065105); *Small & DeWinkeler* 9966 (W--1738550); *Stoutmire* 1111 (Mi). Hillsborough Co.: *Garber s.n.* [May 7, 1876] (W--264067); *J. D. Smith s.n.* [March 10, 1880] (W--936254); *Ward & Ward s.n.* [Feb. 27, 1891] (W--152105). Indian River Co.: *MacDaniels s.n.* [April 16, 1936] (It); *Edw. Palmer* 580 (It). Lake Co.: *Nash* 143 (It, W--228002, W--936253, W--963196), 1944 (W--252161, W--309083). Lee Co.: *Francis* 62 (W--1036540); *Perkins* 477 (It); *J. P. Standley* 10 (W--569468), 12544 (W--896015), 12707 (W--896168), 52526 (W--1308733). Leon Co.: *Godfrey* 62901 (W--2433144). Liberty Co.: *Correll, Correll, & Godfrey* 51595 (N); *Solomon* 2114 (W--2978565). Manatee Co.: *Tracy* 6643 (It, W--383900, W--963195). Martin Co.: *Atwood s.n.* [January 23, 1917] (It); *W. F. Buchanan Jr. s.n.* [March 23, 1888] (W--1739324). Nassau Co.: *Godfrey & Lindsey* 56885 (W--2329836). Okeechobee Co.: *Howell* 1041 (W--1220688). Orange Co.: *Blanton* 6491 (W--1485478, W--1601812); *Meislahn* 213 (W--511502). Osceola Co.: *Mearns s.n.* [April 25, 1901] (W--391077); *Schallert s.n.* [5/2/41] (It). Palm Beach Co.: *Abel s.n.* [25 March '72] (Ne--172775); *F. R. Randolph* 17 (It). Pinellas Co.: *Blatchley* 51 (It); *Tracy* 7588 (It, W--442234, W--959572). Polk Co.: *Jennings & Jennings s.n.* [April 1931] (Go); *Topping* 2609 (W--1729089); *Upton, Upton, & Van Deman s.n.* [March 12, 1930] (It). Saint Johns Co.: *J. D. Smith* 358 (W--936256), *s.n.* [April 14, 1879] (W--936255). Sarasota Co.: *Perkins* 476 (It). Seminole Co.: *Foster, Smith, & Smith, Pl. Exsicc. Gray.* 1334 (It, Mi, W--1923765); *J. P. Young* 1011 (It, W--1102572), *s.n.* [March 31, 1920] (It). Union Co.: *Beckwith* 583 (W--1200035). Volusia Co.: *Correll & Correll* 51856 (N); *B. Williams s.n.* [5.2.74] (Ne--121756). Walton Co.: *Mohr s.n.* [May 11, 1892] (W--859703). Big Pine Island: *H. N. Moldenke* 940 (W--1184406). County undetermined: *Chapman s.n.* [Florida] (W--45352, W--45354, W--936252, W--961151); *Chickering s.n.* [Maynard] (W--152107); *Curtiss s.n.* [Florida] (W--152106). ALABAMA: Baldwin Co.: *Haynes* 7528 (N); *Lelong* 5704 (Ne--100260); *Mohr s.n.* [June 1880] (W--152107), *s.n.* [near the coast] (W--936257), *s.n.* [June 10, 1880] (W--784519). Mobile Co.: *Mohr s.n.* [June 21, 1893] (W--784520). Washington Co.: *R. Kral* 31198 (Mi). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Barratt s.n.* (N). MOUNTED CLIPPINGS & ILLUSTRATIONS: *Kral* in *Godfrey & Wooten, Aquat. Wetl. Pl. Southeast. U. S.* 530, fig. 307. 1979 (Ld); *Raf., Atl. Journ.* 121. 1832 (W).

SYNGONANTHUS FLAVIPES Mold.

Additional bibliography: *Mold., Biol. Abstr.* 64: 6581. 1977; *Mold., Phytologia* 36: 60--61. 1977; *Mold., Phytol. Mem.* 2: 11 [& 623. 1980.

Recent collectors refer to this plant as 40--50 cm. tall, with dry, gray or light-gray inflorescence heads. They have found it "common" or "frequent" on savannas and wet savannas, at 100--120 m. altitude, in both flower and fruit in February and November.

The *Wurdack & Monachino* 39934 distributed and previously cited by me as *S. flavipes*, actually is *S. nitens* (Bong.) Ruhl.

[to be continued]

A NEW NYMPHAEA VARIETY DISCOVERED IN SOUTH CENTRAL AFRICA

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During early 1982, upon completion of documentary and field studies in an around the Okavango River Delta, Botswana, Africa, the author encountered a previously unnamed Nymphaea taxon of the subgenus Brachyceras. While other known taxa are abundant in the region, this new variety, here named N. capensis var. alba is indeed a significant find. The overall plant structure falls between N. capensis var. capensis and the var. zanzibariensis Casp. While possessing characteristics of both taxa, it is more like the latter in overall habit. Flowers of var. alba are pure white, very fragrant, and closely resemble those of the var. zanzibariensis. Floating leaves, while slightly smaller in size, possess the characteristics of var. capensis, especially the typical maroon blotches that appear on juvenile leaves and which fade completely as the leaf matures. Also, marginal indentations closely resemble var. capensis.

Nymphaea capensis Thunb. var. alba K. Landon, var. nov.

Varietate capensis accedens sed floribus albis fragrantissimis, foliis immaturis nigroviridis purpureomaculatisque, foliis maturis supra viridis subtus purpurascens, in horto autofertilibus et veroprogenerantibus.

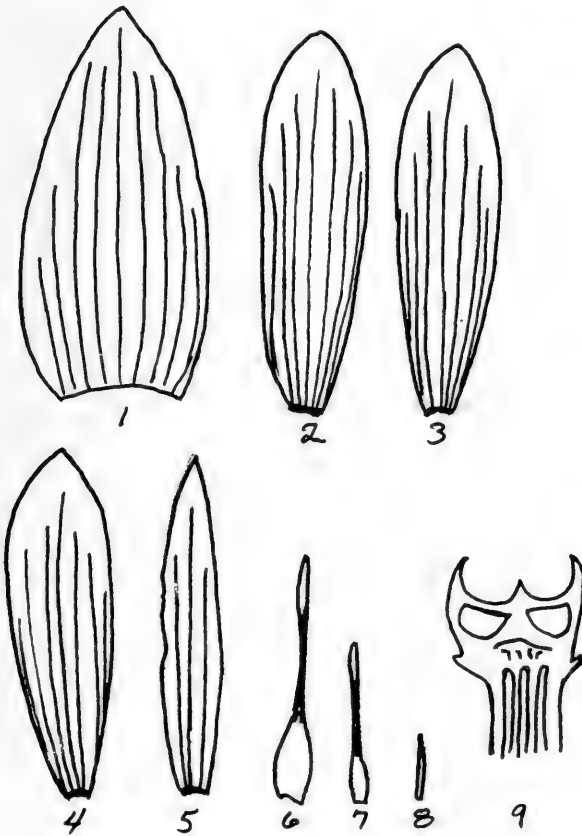
HOLOTYPE (TEX): Grown from stock secured from swamps of the Okavango River Delta, Kalahari Desert (Ngamiland) Botswana, Africa. 17 Oct 1983, K.C. LANDON s.n.

DESCRIPTION. Flowers averaging 12 cm across, opening 3 to 4 successive days from 9 a.m. to 5 p.m.; highly fragrant. BUD...rather broad, oblong-ovate, obtuse or rounded at apex. PEDUNCLE...terete, stout, rising 10 to 20 cm, above the water's surface; light to olive green with light purplish pigment visible beneath epidermis, the six main air canals in the center surrounded by 12 secondary canals followed by 24 smaller outer canals. RECEPTACLES...10 to 15 mm long, yellow, changing to green after submerging. SEALS...4, oblong-ovate, ca. 7 cm long, ca. 4 cm wide; opening 15 to 20 degrees above horizontal; margins gently curved toward apex; outer surface pure green, having no lines or dots but possessing a 3 mm border (average) of white sometimes suffused with maroon; inner surface pure white; posterior sepal narrowest; anterior broadest; primary veins 5 with 2 additional slender nerves. PETALS...ca. 28; all pure white; linear-ovate, the outermost petals obtuse, tapering toward the base, concave within; ca. 24 cm long, ca. 7 cm wide, longer than the sepals in length and not entirely covered by them from 1 to 2 days prior to initial anthesis; the outer 4 stand in a whorl alternate with the

sepals, all or 2 sometimes sepaloid on back just above the base extending upwards approximately half the length. Second whorl consisting of 8 smaller petals, alternate by twos with the sepals. A third whorl of 8 to 12 smaller petals alternates with the second. A few petals of a fourth whorl alternate with the third. All petals except those of the fourth whorl are 5 to 7 nerved. STAMENS...ca. 200, the outermost about $3/4$ to $1/2$ as long as the petals; anthers all longer than the filaments; appendages acicular-lanceolate; appendages always white like the petals; filaments yellow throughout; backs of outer anthers shading from white to yellow at the base. CARPELS...ca. 25, yellow, distinct from one another; stigmatic over all their upper surfaces; styles triangular. Stigmatic basin moderately concave as evidenced by carpellary styles curving upward and rising approximately 7 mm above axile process; axillary process conical, yellow translucent. FRUIT...depressed spheroidal, 5 to 6 cm in diameter, crowned with obtuse incurved styles; stigma concave; ovules small. SEED...ellipsoidal to nearly globose, ca. 1.6 x 1.0 mm.; acuminate at hilum, dull dark olive-brown; germination immediate, ca. 10 days upon submerging or after drying off. LEAF...(first floating) green above bloched with maroon; purple beneath; coriaceous, obicular-ovate; margin slightly wavy in lower half; rounded at apex; sinus deep; margins convex; angles obtuse or subacute. LEAF...(of mature plant) narrowly peltate; ca. 25 cm wide and 27 cm long; texture firm; sinuate-dentate; teeth mostly rounded, sometimes angular and obtuse, depressions between teeth 1 to 5 cm.. deep; apex of leaf rounded, slightly retuse; upper surface bright green; depressed-veiny; maroon bloched when young; bloches fading to pure green upon maturity; undersurface suffused violet or even dark purple; veins green, prominent; primary nerves ca. 10 on each side; sinus depth 10 to 15 cm, margins entire, convex, overlapping above, diverging toward periphery; angles pronounced, acuminate. PETIOLE...smooth, terete, dark green, sometimes with purplish pigment visible through and beneath epidermis; 5 to 10 cm in diameter, 60 to 150 cm long. RHIZOME (TUBER)...ovoid; smaller ones distinctly egg-shaped, varying in size from 10 to 20 mm in diameter; contracted above; apex clothed with long silky hairs, the vegetive bud arising from central portion of apex and surrounded by prominent dead leaf bases; basal portion of tuber smooth; larger rhizomes of rough texture being completely covered with leaf and peduncular scars throughout outer surface.

Distribution: Indigenous to and around the Okavango Delta swamps, Kalahari Desert (Ngamiland), Botswana, Africa.

Nymphaea capensis var. alba. Landon.



1, Anterior sepal, 2,3,4,5, petals, 6,7,8, stamens, all in successive series. 9, cross-section of ovary.

Notes on Begoniaceae -- IV

Lyman B. Smith and Dieter C. Wasshausen

United States National Museum, Washington, D.C., U.S.A.

We find that in our Notes on Begoniaceae -- III we made several errors which we are now correcting.

BEGONIA

- albo-picta* W. Bull, Rare Plants Catalogue 210: 13 London 1855;
Gartenflora 35: 402. 1886; Irmscher, Pareys Blumengart.
2: 79. 1960; Thompson, Begonia Guide 3: R-8. 1976.
maculata Raddi var. maculata sensu Smith & Wass-
hausen, Phytologia 54: 465. 1984.
- brongniartiana* Lemaire, Hortic. Universel 5: 355. 1844, evidently
not the same as *brongniartii* 1843 but description
inadequate.
- colombiana* L. B. Smith & B. G. Schubert, Caldasia 4: 29, pl. 6.
1946, non sensu L. B. Smith & Wasshausen, Phytologia
44: 242. 1979. Differs from *longirostris* Benthams in
its very unequal staminate tepals.
- fischeri Schrank var. fischeri sensu Brade, Rodriguezia 32: 155.
1957.
= *fischeri* Schrank var. *macroptera* (Klotzsch) Irmscher 1953.
- hayatae* Gagnepain, Bull. Mus. Hist. Nat. (Paris) 25: 282. 1919.
aptera sensu Smith & Wasshausen, Phytologia 54:
467. 1984, non Blume 1827.
- hymenophylloides* F. K. Ward, Gard, Chron. 1938, III. 104: 474 in
obs. 1938, nomen validum; Smith & Wasshausen, Phyto-
logia 54: 467. 1954.
- micranthera* Grisebach var. *rhacophylla* (Irmscher) L. B. Smith &
Wasshausen, comb. nov.
hieronymi Lindau var. rhacophylla Irmscher, Bot.
Jahrb. Syst. 74: 619. 1949.
- modesta Liebmann, Vid. Medd. Naturh. For. Kjobenhavn 20. 1853.
= *wallichiana* Lehmann 1850, non Steudel 1840, nomen.

GENERIC SYNONYMS

Knesebeckia

- crenatiflora Klotzsch & Putzeys, Begoniac. 45. 1855.
= *Begonia biserrata* Lindley 1847.
- crenatiflora sensu Smith & Wasshausen, Phytologia 54: 472. 1984,
non Klotzsch & Putzeys 1855.
= *Begonia pedata* Liebmann 1853.

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXIII

Harold N. Moldenke

LEIOTHRIX MARAHUACENSIS Mold., *Phytologia* 54: 234 hyponym. 1983; sp. nov.

Herba parva caespitosa; foliis basalibus rosulatis adscendentibus linearibus ceassiusculis 1--2 cm. longis 1 mm. latis apicaliter obtusis utrinque glabris; pedunculis filiformibus 7--12 cm. longis subglabris vel minutissime sparsissimeque pilosulis; vaginis tenuibus 2 cm. longis arcte adpressis glabris apicaliter fissis; capitulis globosis 7--9 mm. latis griseis vel pallide stramineis.

A small herb, growing in dense tufts, acaulescent; leaves all basal, rosulate, mostly erect or ascending, thick-textured, linear, 1--2 cm. long, about 1 mm. wide throughout, glabrous on both surfaces, apically conspicuously obtuse, issuing from a very dense and conspicuous mass of matted whitish hairs; sheaths slender and rather delicate, closely appressed, 2 cm. long, glabrous, striatulate and slightly twisted, apically bifid; peduncles filiform, 7--12 cm. long, rather indistinctly few-costulate and twisted, subglabrous or very minutely and sparsely scattered-pilosulous; heads globose, 7--9 mm. long and wide, gray or pale straw-color; floral characters as shown in the accompanying plate 1: A - habit, B - involucral bractlet, C - calyx, D - corolla, E - gynoeceum. Illustration by Bobbi Angell.

This distinctive species is based on *Steyermark, Guariglia, Holmgren, Luteyn, & Mori* 126082 from the "Cumbre, altiplanicie de rocas expuestas, escabrosa, rio abajo", at 2330--2470 m. altitude, lat. 3°35' N., long. 65°20' West, in the Cerro Marahuaca-Fhuif, department Atabapo, Amazonas, Venezuela, collected on February 3 or 4, 1982, and deposited in the Lundell Herbarium at the University of Texas.

LIPPIA LOJENSIS Mold., *Phytologia* 54: 235, hyponym. 1983; sp. nov.

Frutex, ramis ramulisque gracillimis tetragonis glabris griseis; internodis abbreviatis; foliis decussato-oppositis; petiolis gracillimis 1 cm. longis parce strigulosis; laminis foliorum chartaceis ellipticis 3--4.5 cm. longis 2 cm. latis apicaliter acutis marginaliter serrulatis basaliter cuneatis supra asperulis subtus rugulosis strigulosisque; inflorescentiis axillatis 2--3 cm. longis; corolla extus alba intus flavidula.

A shrub, 2 m. tall; branches and branchlets apparently very slender, gray, rather obscurely tetragonal and 4-ridged, glabrous; internodes apparently abbreviated, mostly 1--2 cm. long, the leaf-scars elevated; leaves decussate-opposite; petioles very slender, 1 cm. long, sparsely strigulose with rather appressed antrorse whitish hairs; leaf-blades chartaceous, elliptic, apparently uniformly green on both surfaces, 3--4.5 cm. long, 2 cm.

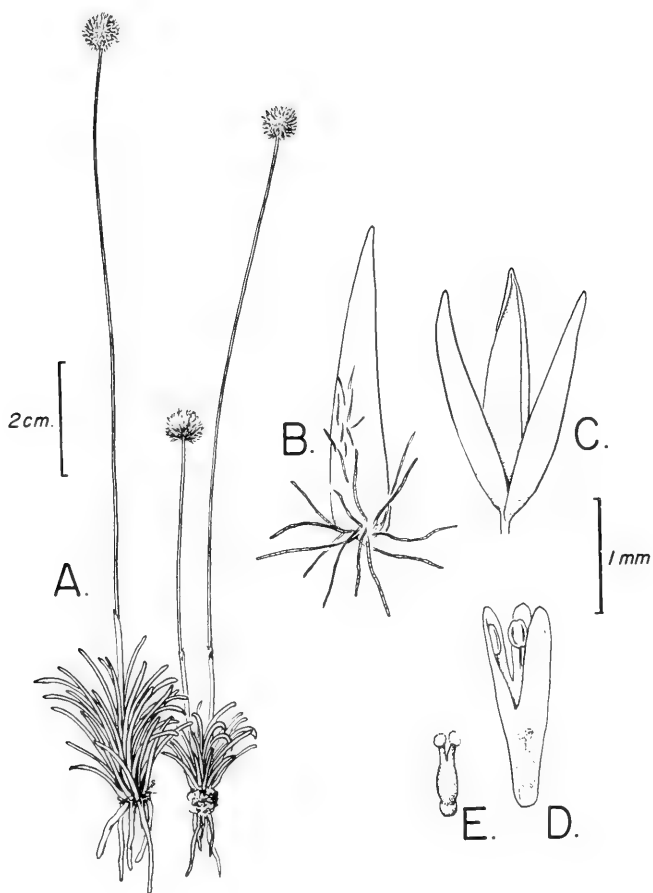


Plate 1
Leiothrix marahuacensis Mold.

wide, apically acute, marginally (except toward the base) serrulate with rather appressed, subacute, antrorse teeth, basally cuneate and entire or somewhat acuminate and prolonged into the upper part of the petiole, asperulous above, rugulose and strigulose beneath, abundantly punctate; inflorescence axillary, opposite, shorter than the subtending leaf, simple, 1-headed; peduncles filiform, 5--15 mm. long, very sparsely white-strigulose with antrorse hairs; heads globose or oblong, 1--1.3 cm. long, almost 1 cm. wide, densely many-flowered and -fruited; bracts conspicuous, broadly obovate, apically rounded, externally and marginally rather densely pilose and hispidulous with hairs of several lengths; corolla hypocrateriform, externally white, internally yellow; other floral characters as shown in plate 2: A- habit, B- corolla viewed sideways, C - corolla-limb viewed from above, D - bract, E - calyx, F - ovary, G - cross-section of ovary. Illustration by Bobbi Angell.

The type of this species was collected by Jeffrey A. Hart (no. 1315) in a dry ravine east of Vilcabamba, at 1800 m. altitude, Loja, Ecuador, on May 10, 1978, and is deposited in the Britton Herbarium at the New York Botanical Garden. The species is obviously related to *L. americana* L.

LANTANA CUJABENSIS f. *ALBIFLORA* Mold., f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species in its corollas being white, with pale-yellow centers.

The form is based on *Strudwick, Sobel, Nelson, Pinheiro, Rosário, & Silva 3404*, collected in secondary growth near the airstrip at Macau, 1 1/2 hours upstream from Lageira airstrip, on the Rio Maicuru, 0°55' S., 54°25' W., at an altitude of about 800 feet, Pará, Brazil, on July 23, 1981, and deposited in the Lundell Herbarium at the University of Texas. The collectors describe the plant as a straggly herb climbing on other nearby vegetation and attaining a height of 3 meters.

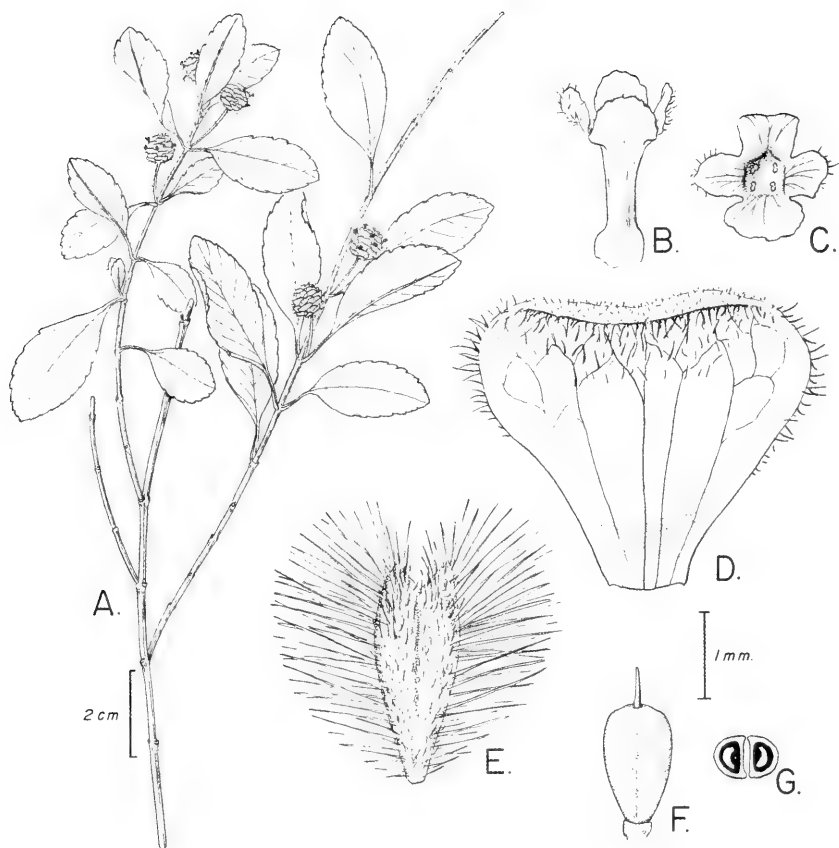


Plate 2
Lippia lojensis Mold.

BOOK REVIEWS

Alma L. Moldenke

"A FEELING FOR THE ORGANISM - The Life and Work of Barbara McClintock" by Evelyn Fox Keller, xix & 235 pp., 14 b/w photo. & 4 fig. W. H. Freeman & Co., New York, N. Y. & San Francisco, California 94104. 1983. \$17.95.

"A feeling for the organism" is what this truly great scientist has had philosophically, intuitively and biologically for her experimental maize plants and all other organisms, an orientation that guided her valuable genetic research work for almost seven decades mainly first at Cornell University and lately at the Cold Spring Harbor Research Station. Her professional career has had some "lows" because of her sex and the failure of some confrères to grasp the nature and importance of her studies and many "highs" which the research per se provided, her demonstrations and explanations of how transpositions operate, and her many important rewards culminating in the Nobel Prize this year. I particularly enjoyed reading this fine biography by Dr. Keller because it recalled for me nostalgically the lectures, lecturers and readings for two graduate courses in genetics years ago.

"NIGHTWATCH - The Natural World From Dusk to Dawn". Photography by Jane Burton and Kim Taylor, text by John Cloudsley-Thompson, Minnie Courtney, Pat Doncaster, Henry Arnold, Tony Wallwork, Michael Allaby & Linda Gamlin, 190 pp., 36 single or double pg. color photo plates, 304 photos, 2 maps & 4 fig. Facts on File, Inc., New York, N. Y. 10016. 1983. \$24.95.

"Until the twentieth century humans, with their limited sensory powers, could find out little about the lives of nocturnal animals" and plants. Such technological aids as various sound recording equipment, radar, radio-tracking, telemetry, infra-red photography and binoculars, image intensifiers, etc. helped make the illustrations of this book so prolific, so beautiful and so natural looking. The legend for each of the pictures is accurate and interesting - and so is the text of 51 succinct chapters, all written by university biologists and naturalists. Some of the chapters are on Moonlight and Starlight, Long Winter Nights, The Churchyard at Night, Echolocation, Night Migration, Courtship and Mating at Night, and Nocturnal Pollination. This beautiful book is a joy to "curl up with" and to share with a "budding" biologist or naturalist, or a senior biologist who has closed the lab or classroom door.

"THE JAPANESE ART OF MINIATURE TREES AND LANDSCAPES - Their Creation, Care, and Enjoyment" by Yuji Yoshimura & Giovanna M. Halford, 220 pp., 25 color photos, 245 b/w photos, 13 line draw., 42 fig. & 5 tab. Charles E. Tuttle Company, Tokyo, Japan & Rutland, Vermont 05701. 1982. \$15.00 paperbound.

This book is as skillfully prepared and as beautifully illustrated as its effectively described contents. The first edition appeared in 1957; this is the 28th printing of which several must have had revisions and additions. The many intricate Japanese systems of classification have been presented as (A) Formal upright, (B) Informal upright, (C) Slancing, (D) Semi-cascade and (E) Cascade, all observing the Japanese rule of "three points" as apices of a triangle symbolizing Heaven, Earth and Humanity. There are chapters on propagation, potting, training, care and judging exhibition bonsai. There are particularly well prepared appendices for equipment, soil analyses and plant indices of English and scientific names and Chinese-Japanese characters.

"EXPERIMENTS IN PLANT TISSUE CULTURE" by John H. Dodds & Lorin W. Roberts, xiii & 178 pp., 15 fig., 11 tab., & 22 b/w photo. Cambridge University Press, Cambridge CB2 1RP, England & New York, N. Y. 10022. 1982. \$10.95 paperbound.

This carefully prepared book introduces "a basic experimental method for each of the major areas of investigation involving the isolation and culture of plant cells, tissues and organs.... arranged in order of increasing technical complexity.....and written mainly for use by college undergraduates, research workers, [etc.].....as a laboratory textbook for a course on plant tissue culture techniques." Some of the topics covered are: culturing cells, tissues and organs, callus initiation and maintenance, and production of secondary metabolites by cell cultures. Bibliographies after each chapter have garnered much valuable literature. An appendix lists commercial sources of supplies for the experiments, mostly from the United Kingdom but also many from the United States.

"RENEWABLE RESOURCE MANAGEMENT FOR FORESTRY AND AGRICULTURE" edited by James S. Bethel & Martin A. Massengale, x & 126 pp., 9 b/w fig. & 20 tab. University of Washington Press, London, England & Seattle, Washington 98105. 1979. \$10.00.

The seven importantly oriented papers in this book were first presented to a Symposium of the American Association for the Advancement of Science in Denver, Colorado, and then presented in this book form by funding from the Geo. S. Long Publication

Series. "Human society needs both food and fuel [as its numbers, and demands increase]. The land base available to agriculture and forestry is adequate to provide massive increases in both types of commodities [optimistic news from those who should know], providing that productive land is efficiently managed for continuous production of the product allocated to it [less optimistic caution because of personal and group greed, ignorance and the stalling devices and tactics of some important politicians]".

"MODERN METHODS IN FOREST GENETICS" edited by J. P. Miksche, xiv & 288 pp., 38 b/w fig., 5 photo., 18 tab. & 1 map. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 1976. \$34.00.

This is one of the valuable members of the Proceedings in Life Sciences. It consists of 13 carefully prepared papers on such topics as: optical measuring of DNA, gel electrophoresis of enzymes and proteins, conifer monoterpenes - analyses by gas-liquid chromatography, foliage plant phenolics and resistance to insects and pathogens, pollution responses, pollen handling techniques with special reference to incompatibility, and hormone flowering manipulation in conifers. The offset printing is particularly neat.

"CREATIVE JAPANESE FLOWER ARRANGEMENT" by Norman Sparnon, 133 pp., 55 fullpage color photo. & 44 b/w photo. Shufumotomo Co., Tokyo & Charles E. Tuttle Company, Inc., Rutland, Vermont 05701. 1982. \$15.00.

The author is considered the western world's leading authority on ikebana and on its outstanding traditional and modern Sogetu school; he has a large active school operating in Sydney, Australia. The Ikebana arranger attempts "to communicate the beauty and the meaning of a flower to others.....combined with an emotional urge toward creativeness that can refine a natural design to the point where it transcends nature." There are succinct articles on balance, variety and unity, form, line and mass, space, color and texture, followed by 40 gorgeous plates accompanied by explanations of the thought processes associated with each arrangement. Then there are 15 step by step lessons on the basic principles and styles of this type of ikebana as shown in the remaining plates. The excellent printing of the exquisite photographs should make anyone marvel at the low price of the book.

"AQUATIC ECOSYSTEMS - An Operational Research Approach" by Jan E. Beyer, ix & 317 pp., 147 b/w fig., 20 tab. & 3 maps. University of Washington Press, Seattle, Washington 98105. 1981. \$20.00.

This revision of the author's doctoral dissertation into book form is directed to quantitative fisheries, biologists, applied mathematicians, biological oceanographers, environmental engineers, modeling ecologists and such students. The author stresses problem formulation and systems analysis. Part I analyzes eutrophication of an estuary, a sill fjord in Denmark, into an integrated ecological and hydrodynamic simulation model evaluating waste water treatment plants. Part II considers growth overfishing of the North Sea herring, recruitment overfishing of the Atlanto-Scandia herring, and a multispecies model for the North Sea ecosystem. Various modeling approaches are evaluated.

"CHROMOSOMAL EVOLUTION IN HIGHER PLANTS" by G. Ledyard Stebbins, viii & 216 pp., 90 b/w fig., 11 photo., 10 tab. & 13 maps. Edward Arnold Publishers, Ltd. U.K. & Addison-Wesley Publishing Co., Reading, Massachusetts 01867. 1971. Cloth-bound & paperback.

"The purpose of this [excellent little] book is to present a review of the most significant information now available bearing upon the problem of how chromosomal variation between individuals, populations and species contributes to the process of evolution. It is intended [and still very useful] for students who have had some background and training in general genetics and cytogenetics". It provides helpful reading for the college student starting with "the three basic functions of chromosomes" and ending with "polyploidy, plant geography, and major trends of evolution".

"RECOGNITION AND SPECIFICITY IN PLANT HOST-PARASITE INTERACTIONS" EDITED BY J. M. Daly & Ikuzo Uritani, xiv & 355 pp., 2 b/w photo., 41 fig. & 3 tab. Japan Scientific Societies Press, Tokyo & University Park Press, Baltimore, Maryland. 1979. \$44.50.

This is a particularly valuable collection of 22 invited papers first presented at a cooperative U. S.-Japanese seminar at the University of Nebraska. After each paper questions, answers and other comments are summarized very efficiently. The major topics about which the presentations are grouped are: genetic information specificity, cytological events in recognition of that specificity, constitutive recognition, and induction of host responses for incompatibility and compatibility. The summaries of each article are succinct. The bibliographies add much pertinent literature through 1976.

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APR 20 1984

NEW YORK
BOTANICAL GARDENNEW SPECIES OF *CHIONOLAENA* AND *STENOCLINE* FROM BRAZIL

(INULEAE: ASTERACEAE).

Harold Robinson
Department of Botany
Smithsonian Institution, Washington, D.C., 20560.

Recent collections of brasilian Inuleae prove to include undescribed species of two of the smaller austral genera, one from *Chionolaena* and one from *Stenocline*.

CHIONOLAENA JEFFREYI H. Robinson, sp. nov.

Plantae herbaceae perennes prostratae vel leniter ascendentes ad 20 cm longae mediocriter vel multo divaricate ramosae subcapitulo innovantes. Caules tenues teretes ad 1 mm lati dense albo-lanati dense foliosi. Folia recte patentia sensim retrorsa indistincte breviter petiolata; laminae anguste ellipticae plerumque 3-8 mm longae et 1-2 mm latae margine integrae planae base breviter cuneatae apice obtusae vix minute apiculatae supra et subtus canescentiter lanatae subtus pallidiores. Capitula in ramis solitaria abrupte terminalia 4-5 mm alta et in sicco late campanulata; squamae involucri ca. 25 scariosae plerumque subaequales 3.5-5.0 mm longae et 0.8-1.2 mm latae glabrae apice subacutae et minute crenulato-serrulatae supra basem sensim margaritaceae. Flores ca. 30 in capitulo; flores feminei ca. 8-10; corollae anguste cylindraceae 2.5 mm longae, lobis plerumque ca. 5 valde inaequalibus 0.05-0.20 mm longis et 0.05-0.10 mm latae subapice minute 1-2-glanduliferis; flores hermaphroditi 20-25; corollae 3.0-3.5 mm longae, tubis et faucibus inferioribus anguste cylindraceis utraque 1 mm longis; faucibus superioribus campanulatis ca. 1 mm longis, lobis triangularibus 0.4 mm longis et 0.3 mm latis subapice 1-2-glanduliferis, cellulis laxe reticulatis extus minime antrorse prorulosi; filamenta in partibus superioribus angusta ca. 0.3 mm longa et 0.04 mm lata cellulis ca. 7-seriatis; thecae antherarum in partibus fertilis 0.7 mm longae in caudicibus 0.4-0.5 mm longae grosse setuliferae; appendices antherarum anguste ovatae ca. 0.35 mm longae et ca. 0.1 mm latae; basi stylorum distincte minute noduliferi; styli in floribus femineis distaliter anguste laeviter ramosi in floribus hermaphroditis vix ramosi et distincte antrorse prorulosi. Achaenia feminei cylindrica 0.8 mm longa dense setulifera, setulis incrassatis; carpodia in cellulis basilaribus distinctis uniseriata; achaenia hermaphrodita sterilia 0.15 mm longa et superne 0.2 mm lata 1-2-setulifera, cellulis carpodii uniseriatis; setae pappi ca. 25 basi connatae 3.0-3.5 mm longae, cellulis apicalibus apice rotundatae vix latiores. Grana

pollinis in diametro ca. 25 μ m.

TYPE: BRAZIL: Bahia: Município de Rio de Contas. Pico das Almas a 18 km NW de Rio de Contas. Elevation 1600-1850 meters. Flowers white. July 24, 1979. *R. M. King, S. A. Mori, T. S. dos Santos 8141* (Holotype, RB; isotypes, CEPEC, MO, US). PARA-TYPE: BRAZIL: Bahia: Middle and upper N.E. slopes of the Pico das Almas ca. 25 km W.N.W. of the Vila do Rio de Contas. Sandstone conglomerate metamorphic and quartzite rock outcrop with associated scrubby vegetation with damp flushes and grassland and marsh in some areas. ca. 41°57' W, 13°33' S. Alt. 1600-1850 m. This plant growing in damp shady crevice of rock overhang on penultimate ridge below summit. Prostrate herb. Stems and leaves whitish-grey. Florets white. 19 March 1977. *R. M. Harley, S. J. Mayo, R. M. Storr, T. S. Santos & R. S. Pinheiro 19677* (CEPEC, K, US).

Chionolaena jeffreyi seems to be the only representative of the genus in Bahia. Other Brazilian species occur in Minas Gerais or in adjacent Rio de Janeiro. The new species is one of those having solitary terminal heads with resulting divaricating subfloral innovations and having sterile achenes in the disk flowers. The species is distinguished from its apparent closest relatives by its more herbaceous prostrate habit and by its small essentially flat leaves that are pubescent on both surfaces. The number of female flowers in the heads seems much less than in the related *C. arbuscula* DC. and *C. lychnophoroides* Sch.Bip., rather suicidally few considering that they are the only flowers in the heads producing fertile achenes. Other species with so few female flowers that have been placed in the genus seem to have fully bisexual disk flowers.

The species is named for Charles Jeffrey of Kew who made the initial determination as a *Chionolaena*.

STENOCLINE HERINGERI H. Robinson, sp. nov.

Plantae herbaceae perennes erectae ca. 5 dm altae pauciscentiter ramosae. Caulis teretes cinereo-lanatae inferne sensim fulviores. Folia alterna superne decrescentia inferiores oblanceolata ad 8 cm longa et 0.8 cm lata non decurrentia apice acuta longitudinaliter trinervata superiores 1.5-2.0 cm longa linearia 1.5-2.0 mm lata supra sparse lanata subtus dense albo-aut flavo-tomentosa. Inflorescentiae plerumque terminales in ramis dense corymbosae, ramis dense tomentosis vel lanatis. Capitula cylindrica 6-7 mm alta et ca. 3 mm lata; squamae involucri ca. 15 plerumque subaequales 5-6 mm longae 1.5-1.8 mm latae base ad medio virides extus lanatae superne margaritaceae glabrae apice breviter vel anguste acutae extus distaliter subtiliter carinatae. Flores ca. 5 in capitulo omnino hermaphroditi; corollae tubiformes superne leniter infundibulares ca. 4 mm longae, tubis ca. 1 mm longis et faucibus ca. 2.5 mm longis extus glabris, lobis triangularibus ca. 0.6 mm longis et 0.3 mm latis extus multo glanduliferis raro 1-2-arachnoideo-piliferis,

cellulis linearibus; filamenta in partibus superioribus ca. 0.2 mm longa inferne ad 0.9 mm lata, cellulis plerumque subquadratis vel breviter oblongis ca. 9-seriatis; thecae antherarum in partibus fertilis ca. 1.1 mm longae in caudicibus ca. 0.5 mm longae multo setulo-fimbriatae; appendices antherarum ovato-triangles ca. 0.3 mm longae et 0.13 mm latae; basi stylorum distincte incrassati subnodulosi, rami stylorum laeves apice subtruncati breviter fimbriati. Achaenia submatura ca. 0.7 mm longa glabra; carpodia lata, cellulis multiseriatis in seriebus unicis basilaribus scleroideis; setae pappi capillaceis ca. 25 facile deciduae ca. 3.5 mm longae base angustiores minute patentiter denticulatae apice leniter latiores, cellulis apicalibus apice rotundatis. Grana pollinis in diametro ca. 25 μ m.

TYPE: BRAZIL: Distrito Federal: Bacia do Rio São Bartolomeu. Erva com pubescência esbranquiçada; capítulos amarelados; campo. 15.VI.1981. E. P. Heringer, T. S. Filgueiras, R. C. Mendonça & B. A. S. Pereira 7055 (Holotype, IBGE; isotype, US).

Stenocline heringeri is the fourth Brazilian species of this small austral genus notable among the Gnaphaliinae for its lack or near lack of female flowers. The new species has neither the broad sessile leaves of *S. chionaea* DC. of Minas Gerais and *S. eriodes* Mattf. of Bahia or the narrowly oblong to linear leaves of *S. gardneri* Baker of Minas Gerais and Bahia. The new species also has less broadly branched inflorescences and more sharply pointed outer involucre bracts than the other three previously described species. *Stenocline heringeri* actually resembles most closely material named as *Achyrocline satureioides* DC. from Paraguay and *A. tomentosa* Rusby and related species from Bolivia and northern Argentina in the broadly oblanceolate leaves, but the latter have more broadly branching inflorescences and have the heads with mostly female flowers that are characteristic of that genus.

The species is named for E. P. Heringer of the Instituto Brasileiro de Geografia e Estatística.



ASTERACEAE of BAHIA, BRAZIL

Cytological and/or Biochemical Vouchers

No. 8141 *Chionolaena jeffreyi* H. Robinson

Município de Rio de Contas, Pico das Almas a 18 km N.W. de Rio de Contas
Elevation 1600-1850 meters

Flowers white.

Robert M. King, Scott A. Mori, T. S. dos Santos
& J. L. Hager

Icon 13

Specimens collected for the United States National Herbarium and the Herbario
Centro de Pesquisas do Cacau at Itabuna

Chionolaena jeffreyi H. Robinson, Holotype, Jardim
Botânica, Rio de Janeiro. Photos by Victor E. Krantz, Staff
Photographer, National Museum of Natural History.



UNITED STATES

2950169

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MEMBRO DA RESERVA ECOLÓGICA DO IBGE

Brasilia - DF.

0900H

Composite

Stenocline heringeri H. Robinson

1. 2

Brasília DF, Recia do Rio São Bartolomeu.

Fruto con subespinula subterminal: capítulos

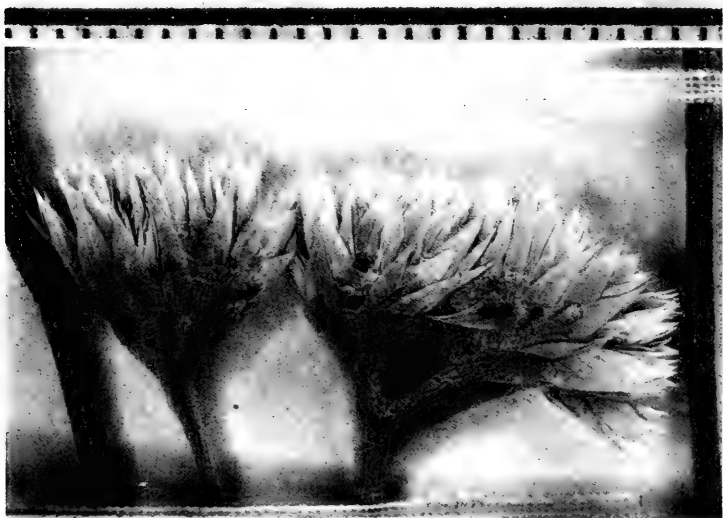
Erva com pubescência
amarelada; campo.

7055

15.VI.195

LEG. L. P. MEXICANUS, T. B. FLORENTINE & C. FLORENTINE & B. & B. FLORENTINE

Stenocline heringeri H. Robinson, isotype, United States National Herbarium.



Enlargements of head. Top. *Chionolaena jeffreyi*. Bottom. *Stenocline heringeri*.

European Black Alder and other plants in Coal-mine
Areas of Western Kentucky

Clyde F. Reed

It is always with great interest when one finds numerous 'new' species of plants in an area or areas where he has been several times before. The present incident occurred in Muhlenberg County, Kentucky, in the claimed coal-mine area, especially near Cleaton on Rt. 70. There I found in the gullies and up on the hillsides nearby, hundreds of stately trees up to 30 ft. tall of the European Black Alder (Alnus glutinosa), A species not reported from Kentucky before, to be best of my knowledge. Not far away were various clumps of Russian olive (Elaeagnus sp.).

Down the road at Drakesboro, I sought the good auspices of a photographer and biology teacher, Joanna Fox, who returned with me to Cleaton and took numerous pictures of the Alders there. Some of those pictures are shown below. Miss Fox indicated that on several of her field trips she had recalled seeing this tree at other reclaimed coal-mine sites in Muhlenberg and neighboring counties.

Later, at the Department of Geology at Bowling Green, I obtained a publication, 'Mine Soil Classification and Use'. revised 1980, published by USDA, Soil Conservation Service, Lexington, Kentucky, and the following information seems worthy of repeating here.

'In 1954 the first act regulating the strip mining of coal was passed in Kentucky. During the period from 1954 to 1966 the most significant development was the permitting of surface mining operations and reorganization of the state agency now known as the bureau of Surface Mining Reclamation and Enforcement.' Other bills passed in 1974, 1975 and 1977 provided for other regulations dealing with coal mining operations. For the last 15 years much attention has been given to the identification of strip mine soil, and the types of vegetation which will eventually take hold and grow on reclaimed strip-mine sites.

The main objective in vegetating mine soil is to stabilize the area as quickly as possible with a permanent and protective cover growth. Also, the nature of the area must be taken into consideration when selecting plant species, and to what use the land will eventually be used, as wildlife land, pasture, hayland, recreation or erosion control.

Some of the species used for revegetating mine-soil areas in the western, as well as the eastern, coal areas of Kentucky, include Balbo rye (Secale cereale), Caucasian bluestem (Andropogon caucasicus), Weeping lovegrass (Eragrostis curvula), 'Lathco' flatpea (Lathyrus sylvestris), Japanese fleecyflower (Reynoutria japonica), Japanese honeysuckle



Vegetation on reclaimed coal-mine field
near Cleaton, Kentucky, showing growth of the
European Black Alder, Poplars, Russian Olive
and Andropogons

(Lonicera japonica), European Black Alder (Alnus glutinosa), Chinese Chestnut (Castanea mollissima), Scotch Pine (Pinus sylvestris), Short-leaf Pine (Pinus echinata), Pitch Pine (Pinus rigida), Bristly 'Arnot' locust (Robinia fertilis), 'Cardinal' Autumnal Russian Olive (Elaeagnus umbellatus), Tatarian Honeysuckle (Lonicera tatarica), Indigobush (Amorpha fruticosa), Amur 'Rem-red' Honeysuckle (Lonicera maackii), Narrow-leaved Russian Olive (Elaeagnus angustifolia) and Fragrant sumac (Rhus aromatica). Many of the local species are also used for re-seeding the sites. Reseeding is done by hydroseeder sprayers that spray lime, fertilizer, seeds and mulch at the same time, especially on areas likely to be subject to erosion, or by helicopter over areas where seeding-machinery cannot function well.

Much of the acreage at Cleaton (Muhlenberg Co.) which consists of more or less rolling hills, I understand was seeded by helicopter. The broad open areas have the grasses and legumes, the gullies the shrubs and trees, such as the European Black Alder, the two species of Elaeagnus, silky dogwood and green ash (Fraxinus pennsylvanica). Visits to Muhlenberg County and several of the other sixteen counties in the coal fields of western Kentucky where surface coal-mining is permitted revealed about half of these species well-established and now part of the flora. Surely, they rate with kudzu, Japanese honeysuckle and Lespedeza cuneata (elsewhere) and Tracaulon (Polygonum) perfoliatum (which has recently become a noxious weed in Maryland, but is rapidly spreading southward and westward) and Reynoutria japonica, all introduced with good intentions. In the eastern coal-mining area there are about 35 counties allowing surface coal mining. In those I have found Castanea mollissima in about one-third on the reclaimed soils, and most of the pine species listed above. Of course the Lespedeza cuneata, Reynoutria japonica and Lonicera japonica are the most common.

More studies need to be made of the numerous reclaimed coal-mine areas in both eastern and western Kentucky to determine what species have remained perennial on these sites. Of course, some of the grasses used were annuals and will not be found unless they have reseeded themselves every year. Vouchers collected in these areas are in Reed Herbarium.

Research Associate
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10105 Harford Road
Baltimore, Maryland 21234



Relative size of European Black
Alder as of July 1983 on the reclaimed
coal-mine field in Muhlenberg County,
Kentucky

CERTAMEN MELASTOMATACEIS XXXVII

John J. Wurdack

Department of Botany, National Museum of Natural History
Smithsonian Institution

As a result of continuing and predominantly Scandinavian field work, 48 taxa of Melastomataceae (16 newly described) have been added to those originally listed in the Flora of Ecuador No. 13 (1980). Apart from the three novelties being described below or noted elsewhere (mostly in Phytologia 52: 61-69. 1982) since 1980, the following have been recently collected (the number-letter prefix indicating the placement in the Flora of Ecuador treatment) and are deposited at AAU or GB (a few at NY), with duplicates of most at US: lb. Adelobotrys klugii Wurdack (Napo: Parque Nacional Yasuni, 260-350 m, Ollgaard et al 38870. Morona-Santiago: Taisha, 250-300 m, Brandbyge & Asanza 32154); 1a. Salpingia secunda DC. (Napo: Río Cuyabeno, 300 m, Brandbyge 33711. Pastaza: Curaray, 250 m, Holm-Nielsen et al 22144); 3a. Triolena amazonica (Pilger) Wurdack (Napo: Nuevo Rocafuerte, 200-230 m, Jaramillo & Coello 4637; San Pablo de los Secoyas, 235 m, Holm-Nielsen 21033, Brandbyge et al 32450; Coca-Iago Agrio, 200 m, Brandbyge et al 30242. Pastaza: Lorocachi, 200 m, Jaramillo et al 30791, 30980, 31253); 43a. Miconia radulaefolia (Benth.) Naud. (Napo: Lagunas de Cuyabeno, 300 m, Brandbyge et al 36031, 36123); 46a. Miconia poeppigii Triana (Pastaza: near Sarayacu, H. Lugo 5412, 5473, 5606); 49a. Miconia prasina (Sw.) DC. (Napo: Añangu, 260-350 m, Ollgaard et al 38871); 59b. Miconia abbreviata Markgraf (Napo: Río Cuyabeno, 230 m, Holm-Nielsen et al 21259; Río Payamino, 250 m, Jaramillo & Coello 4159); 63a. Miconia cannabina Markgraf (Napo: Río Cuyabeno, 250 m, Brandbyge et al 30523); 66a. Miconia pterocaulon Triana (Pastaza: Lorocachi, 200 m, Jaramillo et al 31302); 72a. Miconia minutiflora (Bonpl.) DC. (Pastaza: Montalvo, 300 m, Ollgaard et al 35429, 35494); 76a. Miconia dolichorrhyncha Naud. (Napo: Río Coca, 250 m, Brandbyge & Asanza 30333; Río Cuyabeno, 220 m, Holm-Nielsen et al 21202); 155a. Miconia nodosa Cogn. (Carchi: Julio Andrade-El Carmelo, 3200 m, Luteyn et al 8419); 164a. Miconia chlorocarpa Cogn. (Napo: Sucumbios, 3600-3800 m, Jaramillo & Coello 3909); 4a. Tococa stenoptera Gleason (Napo: Lagunas de Cuyabeno, 300 m, Brandbyge et al 36067); 4b. Tococa coronata Benth. (Napo: Río Cuyabeno, 220-300 m, Holm-Nielsen et al 21196, 21303, 21397, 21445, Brandbyge 33570, 36163); 1a. Clidemia bullosa DC. (Napo: Río Cuyabeno, 300 m, Brandbyge et al 33560); 6a. Clidemia juruensis (Pilger) Gleason (Pastaza: Río Bobonaza, 300 m, Ollgaard et al 34707); 7a. Clidemia heterophylla (Desr.) Gleason (Napo: Coca, 200 m, Harling et al 19859; San Pablo de Secoyas, 300 m, Brandbyge et al 33358; Añangu, 200 m, Ollgaard et al 38946, 38958, 39026); 16a. Clidemia japurensis DC. var. heterobasis (DC.) Wurdack (Pastaza: Río

Ishpingo, 285 m, Ollgaard et al 35031); 25a. Clidemia gracili-flora Huber (Pastaza: Río Bobonaza, 300 m, Ollgaard et al 34709); 1a. Henriettea cf. stellaris Berg ex Triana (Napo: Lagunas de Cuyabeno, 250 m, Brandbyge et al 30518, 33857, 33987; Río Cuyabeno, 300 m, Brandbyge et al 33623); 5a. Henriettella loretensis Gleason (Napo: Lagunas de Cuyabeno, 300 m, Brandbyge 33935); 3b. Leandra boissieriana Cogn. (Napo: Río Cuyabeno, 300 m, Brandbyge et al 33704); 3c. Leandra candelabrum (Macbride) Wurdack (Napo: Puerto Montufar, Río Cuyabeno, 230 m, Holm-Nielsen et al 21252. Pastaza: Lorocachi, 200 m, Brandbyge & Asanza 30803); 1b. Ossaea bullifera (Pilger) Gleason (Pastaza: Río Bobonaza, 300 m, Ollgaard et al 34510); 7a. Ossaea rufibarbis Triana (Esmeraldas: San José, Boom 1290).

MERIANIA FINICOLA Wurdack, sp. nov.

In systemate Cogniauxii M. tomentosae (Cogn.) Wurdack et M. pichinchensi Wurdack affinis, floribus minoribus petalis albis differt.

Ramuli primum sulcato-quadrangulati demum teretes sicut folia novella inflorescentiaque pilis dense asperis 0.1-0.2 (-0.3) mm longis in foliorum superficie ubique caducis dense setulosi; linea interpetiolaris tenuis evoluta. Petioli (1.5-)2-3 (-3.5) cm longi; lamina 14-22 X 8-14 cm ovato-elliptica apice subabrupte ca 1 cm hebeti-acuminato basi rotundata et paullulo (2-4 mm) emarginata, subcoriacea et distant 2-4 mm) callosa-serrulata, supra obscure bullata, 7-nervata (pari 2-4 mm inframarginali incluso) nervis secundariis plerumque 3-5 mm inter se distantibus subtus sicut nervulis paulo elevatis nervulis subtus laxe (ca 2 mm) areolatis. Panicula ca 15-18 cm longa; flores 5-meri in ramis primariis ca 8-10 umbelliforme terminales bracteis ca 15 X 12 mm caducis involucreti. Hypanthium (ad torum) 4.5-5 mm longum dense strigulosum pilis 0.2-0.3 (-0.5) mm longis asperis ad basim expansis; calyx in alabastris maturis 5-5.5 mm longus (rostrum hebeti ca 1-2 mm longo incluso) densiuscule minuteque strigosus ad anthesim supra torum irregulariter deciduus. Petala glabra 10-11 X 7-10 mm late obovata apice rotundato-truncato. Stamina anisomorphica glabra, antherarum thecis subulatis poro 0.15-0.2 mm diam. dorsaliter inclinato. Stamina maiora: filamenta 5-5.5 mm longa; antherarum thecae 6-7.2 X 0.8-1 X 1.5-2 mm; connectivum non vel paullulo (0.1 mm) prolongatum, appendice basali ca 1.5-2 mm longa hebeti vel paullulo emarginata tuberculo dorsali ca 0.2 X 0.2 mm. Stamina minora: filamenta 6-7 mm longa; antherarum thecae 4.4-5.3 X 0.7-1 X 1.4-1.5 mm; connectivum 0.4-0.6 mm prolongatum, appendice basali 0.9-1 mm longa hebeti tuberculo dorsali 0.25 mm longo hebeti. Stigma non expansum; stylus 10-12.6 X 1.2-0.4 mm glaber; ovarium 5-loculare glabrum apice hebeti 0.3-0.7 mm 5-lobulato.

Type Collection: H. Balslev, J. L. Luteyn, & B. Boom 2575 (holotype US 2992524; isotypes AAU, QCA), collected in disturbed montane forest at Km 2 of Santa Barbara-La Bonita road, 0°40' N, 7°35' W, Prov. Napo, Ecuador, elev. 2750 m, 17 May 1982. "Arbol delgado de 6 metros. Flores blancas."

Paratype: D. D. Soejarto 1069 (ECON, US), from Cerro Portachuelo, Buenos Aires Point, Com. Putumayo, Colombia, elev. 2800 m, 25 July 1964. "Shrub 3-4 m tall. Sepals green, petals white."

Both suggested relatives have calyces 10-15 mm long, orange-red petals 15-23 mm long, filaments 11-15 mm long and anther thecae 8-10 mm long; the connective appendages and ovaries in all three species are qualitatively similar. The species-pair Cen-tronia phlomoides Triana-C. grandiflora Standley certainly should be transferred by a monographer to Meriania and are closely related to M. finicola, differing in the greater vegetative pubescence development (setulose lower leaf surfaces) and larger flowers (petals 16-20 mm long, but white) with longer hypanthial hairs. The description of M. finicola is based upon the type, the Colombian paratype differing in minor vegetative features (petioles up to 10 cm long, blades obscurely plinerved 0.4-1 cm).

MERIANThERA SIPOLISII (Glaz. & Cogn.) Wurdack, comb. nov.

Meriania sipolisii Glaz. & Cogn., DC. Mon. Phan. 7: 1182. 1891.

MERIANThERA BURLEMARXII Wurdack, sp. nov.

M. sipolisii (Glaz. & Cogn.) Wurdack affinis, foliis ad apicem hebeti-acutis subtus in superficie demum esetulosis, floribus solitariis differt.

Rami tumidi teretes primum furfuracei mox glabrati. Folia terminaliter conferta; petioli ca 0.7-1.5 cm longi; lamina (paulo immatura) 7-11 X 5-6.5 cm late ovato-elliptica apice hebeti-acuto basi late obtusa vel rotundata, chartacea et integra, ubique primum modice arachnoideo-puberula in superficie supra mox et subtus demum glabrata subtus in venis primariis persistenter puberula (0.1-0.3 mm) in superficie modice resinoso-glandulosa, 5-nervata nervis secundariis 3-5 mm inter se distantibus venularum areolis ca 0.5 mm latis. Flores ad ramorum apices solitarii; pedicelli 2.5-3 cm longi et 1-2-articulati, bracteolis 2-3 X 0.2-0.4 mm caducis. Hypanthium (ad torum) ca 6 mm longum sicut calyx extus densissime arachnoideo-furfuraceum; calyx ca 5 mm longus (in alabastris clausus?), lobis interioribus ca 3 mm longus ovatis, dentibus exterioribus crassis ca 1 mm eminentibus. Petala ca 30-35 X 23-27 mm late obovata (apice rotundato) extus in alabastris sparse furfuracea mox glabrata. Stamina dimorphica; filamenta basim versus sparsissime glanduloso-puberula, thecis oblongo-subulatis. Stamina maiora: filamenta 10 mm longa; thecae 7-8.1 X 1 X 1.8 mm, poro dorsaliter inclinato; connectivum 0.9-1 mm prolongatum dorsaliter dente basali hebeti 0.5 mm longo descendenti et appendice ascendenti 5-5.3 X 0.35 mm (apice expanso ca 1.2 mm lato) armatum. Stamina minora: filamenta 14-15 mm longa; thecae 4.5-5 mm longae, poro ventraliter inclinato; connectivum 0.2-0.3 mm prolongatum dorsaliter dente hebeti 0.5 X 0.2 mm descendenti et appendice ascendenti 3 X 0.3 mm (apice expanso emarginato 0.6 mm lato) armatum. Stigma non expansum; stylus 17 X 0.7-0.3 mm basim versus sparse glanduloso-puberulus (0.1-0.3 mm); ovarium

5-loculare et omnino inferum, cono apicali costulato 1 mm alto sparse glanduloso-puberulo.

Type Collection: P. C. Hutchison 8472 (holotype RB; isotype US), collected in garden of Roberto Burle Marx, Rio de Janeiro, Brazil, 24 Sep. 1983. "Stem rather fleshy, easily cut, compartmentalized in longitudinal section, to 75 cm tall, rooting where touching ground. Leaves deciduous in winter, the flowers appearing with the young leaves and lasting 2-3 days. New leaves brown-lanate, glabrous above at maturity, brown-lanate on veins below. Petals magenta."

Paratype: F. P. Darke D-98 (US), cultivated at Longwood Gardens, Acc. No. 770066 from Roberto Burle Marx, 13 April 1978. "Herb to 12 cm; stem fleshy, grayish brown; leaves medium green, all congested terminally; petals stiff, purple (RHS Fan 2, 72/B)."

Merianthera sipolisii has leaf blades rounded to retuse at the apex and permanently and densely arachnoid-pubescent beneath, well developed panicles, petals externally densely furfuraceous, and small stamens with the descending connective tubercle 1.6-1.7 mm long. The generotype, M. pulchra Kuhlmann, has esetulose leaf blades rounded at the apex, developed panicles, hyaline calyx with external calyx teeth undeveloped, nearly glabrous petals only 14.5-16 X 14-15 mm, and glabrous filaments and style; the anther morphology is like that in M. burlemarxii. In all three species, the 5-celled ovary is completely inferior and with a sparsely to moderately glandular apical column 1-1.4 mm high; the anther pore is dorsally inclined in the large anthers, ventrally in the small ones. Burle Marx's plants were introduced into his garden from Vila Panca, Rio Doce, Mun. Colatina, Espirito Santo.

ADELOBOTRYS ANTIOQUIENSIS Wurdack, sp. nov.

A. panamensi Almeda affinis, foliis breviter petiolatis laminis ad basim panduriformibus cordulatis fructibus maioribus differt.

Ramuli primum compressi demum teretes sicut folia inflorescentiaque primum glandulis ca 0.05 mm longis caducis sparse induti (in foliis novellis pilis malpighiis caducis sparsissime evolutis) alioqui glabri. Petioli 0.5-1(-1.5) cm longi crassi; lamina (16-)20-32 X (7-)10-16 cm oblongo-panduriformis apice abrupte vel subabrupte per 0.5-1 cm hebeti-acuminato basi 3-5 mm cordulata, subcoriacea et integra, 2-4 cm 5-plinervata nervis secundariis ca 5-8 mm inter se distantibus nervulis subtus laxe reticulatis areolis (2-)3-5 mm latis. Inflorescentia multiflora (floribus 12-32) primum terminalis demum lateralis subumbelliformis axe 0.5-1 cm longo plerumque breviter trifurcata, pedicellis ad anthesim ca 15 mm longis (in fructu usque ad 25 mm). Hypanthium (ad torum) 4 mm longum; calyx ca 2.5 mm longus limbo expanso integro. Petala glabra 13.5-14 X 6-6.2 obovato-oblonga apice rotundato-truncato. Stamina paulo dimorphica glabra, thecis subulatis poro 0.2-0.25 mm diam. dorsaliter inclinato, connectivis non prolongatis, connectivi appendice ascendenti subtereti ad apicem hebeti-rotundato et dente basali acutissimo.

Stamina maiora: filamenta 9.5 mm longa; thecae 8 X 0.7 mm; connectivi dens basalis 0.5 mm longus, appendice ascendenti 2.2 X 0.3 mm. Stamina minora: filamenta 10 mm longa; thecae 4.8-5 X 0.7 mm; connectivi dens basalis 0.4-0.5 mm longus, appendice ascendenti 1.8-2 X 0.3 mm. Stigma punctiforme; stylus 9 X 0.6-0.15 mm glaber; ovarium 5-loculare apice truncato et sparsissime glandulis 0.05 mm longis induto; semina numerosa ca 0.5 X 0.35-0.4 mm cuneata sublaevia.

Type Collection: Juan José Hernández, Saulo Enrique Hoyos, & Jorge Rpo. 162 (holotype HUA 15580; isotypes HUA, US), from near El Palacio along the Medellín-Bogotá highway, Sector Río Samaná-Río Claro, San Luis, Antioquia, Colombia, elev. 550 m, 5 Dec. 1981. "Arbusto de 3 mts. Flor de cáliz blanco y corola lila, estambres de anteras amarillas. Común y creciendo en bosque de transición."

Paratypes (HUA, US, both near-topotypical, fruiting): Albert & Brand 267, from between El Palacio and Josefina, elev. 670 m ("Arbusto de 2 m"); Hernández, Hoyos, & Rpo. 153, from near El Palacio, elev. 550 m ("Arbusto de 4 m").

The Panamanian relative has leaves with petioles mostly 2-4 cm long and blades with acute bases, as well as fruiting hypanthium plus calyx 6-7 mm (rather than 9-10 mm) long; a recent (fruiting) collection is Correa et al 3061 (near Copé, Coclé), the capsules (3-4-)5-locular.

ADELOBOTRYS HOYOSII Wurdack, sp. nov.

A. antioquiensis Wurdack affinis, inflorescentiis bene evolutis ovarii apice 5-lobulato differt.

Ramuli novelli subancipites sicut folia hypanthiaque glandulis minutis caducis sparse obsiti alioqui glabri. Petioli liberi 0.3-0.5 cm longi; lamina (22-)28-52 X (10-)14-23 cm elliptica apice subabrupte per 0.5-1.5 cm hebeti-acuminato basi anguste attenuata et cordulato-rotundata, subcoriacea et integra, 5-plinervata pari interiore 3-6 cm et pari exteriore 2.5-4.5 cm supra basim divergenti nervis secundariis 5-10(-15) mm inter se distantibus nervulis subtus laxe reticulatis areolis plerumque 3-5 mm latis. Panicula ca 9-18 cm longa multiflora terminalis; pedicelli 10-13 mm (in fructu usque ad 25 mm) longi. Hypanthium (ad torum) 4 mm longum; calyx ca 3.8 mm longus, limbo expanso integro. Petala glabra 16.7-17.2 X 9 mm obovato-oblonga apice rotundato. Stamina paulo dimorphica glabra, thecis subulatis poro 0.25 mm diam. dorsaliter inclinato, connectivis non prolongatis, appendice ascendenti subtereti ad apicem hebeti-rotundata, dente basali acuto infra apicem obscure auriculato. Stamina maiora: filamenta 8.7-9 mm longa; thecae 7.4-7.6 X 1 mm; connectivi dens basalis 0.5 mm longus, appendice ascendenti 3 X 0.7 mm. Stamina minora: filamenta 12.7-12.9 mm longa; thecae 5.6-5.9 X 0.9 mm; connectivi dens basalis 0.7 mm longus, appendice ascendenti 3 X 0.9 mm. Stigma punctiforme; stylus 10 X 1-0.25 mm glaber in ovarii collo 1 mm immersus; ovarium 5-loculare apice 5-lobulato et sparsissime glandulis 0.05 mm longis induto; hypanthium fructiferum calycem includens ca 6 mm longum; semina

numerosa ca 0.5 X 0.3 mm cuneata sublaevia.

Type Collection: Juan José Hernández & Saulo Enrique Hoyos 588 (holotype HUA 018100; isotype US), collected along the Medellín-Bogotá highway (Sector Río Samaná-Río Claro) east of Josefina, San Luis, Depto. Antioquia, Colombia, elev. 740 m, 13 Dec. 1982. "Arbolito de 7 m. Flores de cáliz blanco, corola morada. Abundante y creciendo en bosque primario perturbado."

Paratypes (all from along the Medellín-Bogotá highway between Río Samaná and Río Claro, San Luis, Antioquia, Colombia): L. Albert, M. Escobar, & M. Giron 140 (HUA, US), topotypical, elev. 700 m ("Arbusto de 4 m. Frutos cápsulas blancas, cuando maduran se tornan café"); Hernández & Hoyos 493 (HUA), topotypical, elev. 780 m ("Arbusto de 5 mts. Frutos secos"); Hernández & Hoyos 402 (HUA), near Altavista, elev. 720 m ("Arbusto de 2 m. Fruto seco café"); Hernández & Hoyos 414 (HUA), near Altavista, elev. 600 m, 24 June 1982 ("Arbolito de 5 m. Flores de caliz blanco, petalos lila, anteras amarillas y lila"); Hernández, Hoyos, Borja, & J. Rpo. 659 (HUA), Río Claro, elev. 350 m, 14 Jan. 1983 ("Arbusto debil de 2 m. Flores lila. Frutos blancos").

Both A. antioquiensis and A. panamensis Almeda have much contracted inflorescences, as well as truncate ovary apices.

MICROLICIA COMPARILIS Wurdack, sp. nov.

M. cinereae Cogn., M. subaequali Wurdack, et M. petasensi Wurdack affinis, floribus minoribus differt.

Ramuli primum quadrangulares demum teretes sicut folia sepala (extus) hypanthiaque densiuscule setulosi pilis gracillimis 0.3-0.4 mm longis eglandulosis. Folia conferta appressa essentialiter sessilia petiolis ca 0.1 mm longis; lamina 2.4-2.7 X 0.7-1 mm lanceata vel oblongo-lanceata apice acuto basi rotundata vel paullulo (0.1 mm) auriculata, rigidiuscula et integra, subtus modice impresso-punctata, uninervata. Flores ad ramulorum apices solitarii-terni 5-meri, pedicellis obscuris ca 0.2 mm longis. Hypanthium (ad torum) 2.3 mm longum teres; calycis tubus 0.2 mm longus, lobis 1.8 X 0.9 mm lanceatis ad basim paulo remotis intus sparse strigulosis. Petala 4.6-5 X 2.7-3 mm obovata apice late acuto et setula 0.2-0.3 mm longa eglandulosa terminato alioqui glabra. Stamina isomorphica glabra; filamenta 2-2.1 mm longa; thecae 1.6-1.7 X 0.4 X 0.6 mm (rostro 0.2 mm longo incluso) oblongae poro 0.1 mm diam.; connectivum 0.7-0.8 mm prolongatum appendice ventrali 0.2-0.25 mm longa apice hebeti emarginato. Stigma 0.15 mm diam.; stylus 5.8 X 0.2-0.25 mm glaber; ovarium 3-loculare glabrum apice ca 0.3 mm emarginato.

Type Collection: L. A. Mattos Silva, Elton M. C. Leme et al 1636 (holotype CEPEC 30937; isotype US), collected among rocks at Km 12, Palmeiras-Mucugê road, Município Palmeiras, Bahia, Brazil, 13 Jan. 1983. "Arbusto bastante ramificado, aprox. 50 cm de altura. Flores roxas com estames amarelos."

Microlicia cinerea has larger leaves and flowers, with the connective prolongation in the large stamens much longer and the ventral appendage well-developed; in pubescence, M. comparilis

and M. cinerea are similar. Microlicia subaequalis has larger and less densely pubescent leaves, much longer (3-3.2 mm) calyx lobes, corolla 7.5-8 X 4.2-4.8 mm, and anther thecae 2.4-2.6 mm long; M. petasensis has sparser vegetative pubescence, petals 7.9-8.3 X 4-4.3 mm, and larger dimorphic stamens (connective in the large series prolonged 5-6 mm and with ventral appendage 0.6-1 mm long). More distant relatives perhaps are M. consimilis Wurdack (3-nerved leaves 5-9 mm long, calyx lobes 2.5 mm long) and M. minima Markgraf (esetulose leaves and hypanthia, smaller leaf blades, and somewhat longer anther thecae). Microlicia minima var. aristifera has now been recollected (Hatschbach 46522, airport, Mun. Rio de Contas, Bahia, 17 May 1983).

TIBOUCHINA MARUMBIENSIS Wurdack, sp. nov.

T. hatschbachii Wurdack affinis, foliorum petiolis longioribus laminarum venis primariis lateralibus ad basim conjunctis staminum maiorum connectivis vix prolongatis stylo glabro differt.

Ramuli primum obscure quadrangulati mox teretes dense pilis laevibus laxe appressis usque ad 1 mm longis strigulosi. Petioli plerumque 1-1.5 cm longi; lamina (3-)4-8 X (1.5-)2.5-4.3 cm ovato-elliptica apice late acuto basi obtusa, rigidiuscula et integra densiuscule appresso-ciliolata, supra pilis laevibus (0.2-)0.5-1 mm longis incurvo-appressis ad basim paulo expansis sparsiuscule induta, subtus pilis gracilibus ca 1 mm longis modice setulosa, 5-nervata nervis primariis lateralibus ad basim 0.3-0.6 cm coalitis nervis secundariis ca 2-3 mm inter se distantibus. Flores solitarii terminales 5-meri bracteis 4-6 involucriati; bractee 8-10 X 12-15 mm oblatae liberae extus sicut hypanthium calycis lobique densissime sericeo-strigosae (pilis plerumque 1.5-2 mm longis) intus glabrae. Hypanthium (ad torum) ca 8 mm longum; calycis lobi 7-10 X 6-7 mm asymmetrico-ovato-oblongi (apice rotundato) dense ciliolati (ciliis 0.5-1 mm longis). Petala 35-47 X 32-37 mm asymmetrico-ovata apicem versus ciliolata pilis 0.3-0.5(-1) mm longis p. p. glanduliferis. Stamina dimorphica, filamentis basim versus sparsiuscule vel modice glanduloso-setulosis (pilis 0.3-1.2 mm longis), thecis subulatis ca 1-1.2 mm latis, poro ca 0.6 mm diam. ventraliter inclinato. Stamina maiora: filamenta (15-)19-21 mm longa; thecae (12-)14-17 mm longae; connectivum 5-7 mm prolongatum, lobis ventralibus minutis ca 0.2-0.3 X 0.2-0.3 mm. Stamina minora: filamenta (10-)12-13 mm longa; thecae 12-13 mm longae; connectivum 0.5-1.3 mm prolongatum, lobis ventralibus (0.3-)0.5 X (0.3-)0.4 mm hebetibus. Stylus 24-25 X 1-0.6 mm glaber.

Type Collection: G. Hatschbach 23934 (holotype MBM 13221; isotype US), collected in cloud forest on Serra Marumbi, Mun. Morretes, Paraná, Brazil, elev. 1300-1400 m, 27 Feb. 1970. "Arbusto 1 m 50, flor purpurea."

Paratypes (both topotypical): Hatschbach 23912 (MBM, US), elev. 1300 m ("Arbusto 2 m, flor violeta"); Hatschbach 44585 (MBM, US) ("Arbusto 2 m, flor violeta").

In T. hatschbachii, the cauline hairs are patent, the petioles only 0.2-0.6 cm long, the primary leaf veins free to the

base, the inflated ventral lobes in the large stamen connectives ca 0.6 X 0.6 mm, and the style is basally setulose. Also related are T. boraceiensis Brade (cauline hairs patent, leaf blades 7-nerved with denser finer pubescence above, floral bracts only two, flowers smaller with large stamen connectives ventrally with inflated appendages ca 0.6 X 0.5 mm) and T. campos-portoi Brade (leaf blades beneath much less pubescent with appressed hairs and primary veins free to the base, bracts and calyx lobes acute, ventral lobes of large stamen connective appendage ca 1 mm long). In Cogniaux' monograph, species 14-16 (all with acute calyx lobes and long ventral appendage in the stamen connective) seem more distantly related, as do T. dusenii Cogn. (also from Marumbi) and T. catharinensis Brade.

MICONIA COMPTIFOLIA Wurdack, sp. nov.

M. oldemanii Wurdack affinis, ramulorum nodis non callosis foliorum laminis minus plinervatis filamentis glanduloso-puberulis differt.

Ramuli acute quadrangulati sicut petioli inflorescentiaque primum modice granuloso-furfuracei (granulis 0.05-0.1 mm latis rufidulis) demum glabrati. Petioli (1.5-)2-6(-14) cm longi ca 0.5-1 mm alati; lamina 18-35(-45) X 9-17(-31) cm elliptica apice per 0.5-1.5 cm subabrupte acuminato basi late acuta vel obtusa, chartacea et distanter undulato- vel subcrenulato-serrulata, supra glabra, subtus in venis primariis secundariisque sparsiuscule vel sparse caduceque granuloso-furfuracea alioqui glabra, breviter (0.5-1.5 cm) 5-plinervata vel pseudoplinervata nervis secundariis ca 1-1.5 cm inter se distantibus nervulis subtus laxe reticulatis (areolis 1-1.5 mm latis). Inflorescentia 12-20 cm longa anguste oblonga ramis primariis 0.3-0.8 cm longis paucifloris; flores 5-meri ut videtur sessiles (pedicellis crassis ca 0.5-1 mm longis), bracteolis 0.3 mm longis subulatis subpersistentibus. Hypanthium (ad torum) 4.1-4.2 mm longum basim versus sparse granuloso-furfuraceum; calyx 0.8 mm altus integer, dentibus exterioribus minutis ca 0.1 mm eminentibus; torus intus sparse glandulosus (0.1 mm). Petala pruinoso-furfuracea ca 5 X 2.8-3 mm oblongo-obovata apice rotundato paulo emarginato. Stamina paulo dimorphica, filamentis 5.7 mm vel 4 mm longis sparse glanduloso-puberulis (0.1 mm), thecis subulatis, poro 0.1 mm diam., connectivo non prolongato ventraliter ad basim glandulis stipitatis paucis (2-6) ornatis. Stamina maiora: thecae 6-6.2 X 0.5-0.6 X 0.7-0.8 mm, poro ventraliter inclinato. Stamina minora: thecae 5-5.1 X 0.5-0.6 X 0.7 mm, poro dorsaliter inclinato. Stigma truncatum vel paullulo expansum 0.4 mm diam.; stylus 12.5 X 0.3-0.4 mm glaber in ovari apicem ca 0.3-0.4 mm immersus; ovarium 3-loculare ca 1/5-1/4 inferum apicem versus sparse glanduloso-puberulum (0.1 mm).

Type Collection: R. Boyan 291 (INPA Herb. No. 21108) (holotype INPA), collected south of "San Antonio (?)," Amazonas, Brazil, 4 Mar. 1968. "Small tree in open places. Leaves smooth and fleshy. Flowers pink."

Paratypes (all Manaus-Caracarai Road, Amazonas, Brazil):

Prance, Philcox, Rodrigues, Ramos, & Farias 4986 (INPA, NY, US), Rio Urubu between Cachoeira Iracema and Natal, 5 June 1968 ("Shrub 5 m tall, in forest on terra firme. Inflorescence and young fruit pink"); Prance & Coêlho 17577 (INPA, NY, US), Reserva Experimental do INPA, Km 60, 27 Sep. 1973 ("Treelet 4 m in forest on terra firme. Buds brown"); Susanne Renner 239 (INPA, US), north of Km 90, World Wildlife Fund reserves along ZF3 road, 11 Dec. 1981 ("Tree 3-6 m tall, frequent in primary forest. Young fruit light red"); Loureiro, Mello, & de Miranda INPA 48.199 (INPA), Km 123, 20 Apr. 1974 ("Arbusto de 2 metros; flores crème; terra firme; solo argiloso"); Loureiro, Lima, & Faustino INPA 48.146 (INPA), Km 124, 26 Mar. 1974 ("Arbusto de 3 metros; frutos verdes; terreno firme arenoso"); Loureiro, Pires, de Miranda, Lima, & Albuquerque INPA 48.073 (INPA), Km 125, 22 Mar. 1974 ("Arbusto de 4 metros; flores cremes; terra firme"); Loureiro, Lima, & Faustino INPA 47934 (INPA, US), Km 128, 14 Feb. 1974 ("Arvoreta de 5 m; flores brancas; frutos vermelhos").

Miconia oldemanii has branchlet nodes with annuli around the petiole bases, leaf blades long-decurrent at the base with free petioles only 0.3-1 cm long and the inner pair of primary veins diverging 2-6 cm above the blade base, and filaments glabrous; in other floral details, including the calyx persistent in fruit, the two species are alike. My original remarks concerning the affinities of M. oldemanii may not be germane; the relationship may well be closer with M. furfuracea (Vahl) Griseb., M. simplex Triana, and M. sanctiphilippi Naud. The general facies of M. comptifolia is rather like that of M. eriodonta DC., but not the pubescence or flowers.

MICONIA HYLOPHILA Wurdack, sp. nov.

M. pubipetalae Miquel affinis, floribus 6-meris brevissime pedicellatis ovario 4-loculari differt.

Ramuli primum obscure rotundato-quadrangulati mox teretes sicut foliorum venae primariae et secundariae inflorescentiaque densissime pilis pinoideis 0.1-0.15 mm longis induti. Petioli (1.5-)2-3(-3.5) cm longi; lamina (8-)12-20(-24) X (3.5-)6-9(-11) cm elliptica vel oblongo-elliptica apice subabrupte 1-2 cm caudato-acuminato basi late acuta, subcoriacea et integra, supra glabra, subtus in venulis superficieque densissime pilis rufidulis stellulato-pinoideis 0.05-0.1 mm longis obsita, trinervata (pari tenui inframarginali excluso) nervis secundariis ca 5-7 mm inter se distantibus nervulorum areolis ca 0.5 mm latis. Panicula 5-12 cm longa multiflora ramis primariis in quoque nodo plerumque 4; flores 3-5-aggregati 6-meri, pedicellis ca 0.4-0.6 mm longis crassis, bracteis 2-2.8 X 1.6-2 mm subpersistentibus. Hypanthium (ad torum) ca 2.7 mm longum dense minuteque pinoideo-puberulum; calycis tubus 1 mm longus intus et extus modice pinoideo-puberulus, lobis 0.8 mm longis oblongis (apice rotundato) intus glabris, dentibus exterioribus minutis inframarginalibus. Petala 5-5.8 X 1.5-1.9 mm obovato-oblonga modice granulosa. Stamina dimorphica, filamentis 5.3-5.5 mm vel 3.3-3.8 mm longis glabris, thecis subulatis poro 0.1 mm diam. Stamina

maiora: thecae 4.7 X 0.6 mm, poro ventraliter inclinato; connectivum non prolongatum ventraliter hebetè bilobulatum et glandulis 1-2 ornatum. Stamina minora: thecae 3.2-3.5 X 0.45 mm, poro dorsaliter inclinato; connectivum obscure (0.1 mm) prolongatum ventraliter bilobulatum et plerumque eglandulosum. Stigma non expansum; stylus 8.5 X 0.5 mm ad basim sparsiuscule stellulato-puberulus in ovarii apicem ca 0.4 mm immersus; ovarium 4-loculare et ca 1/4 inferum apice granuloso.

Type Collection: J. Brandbyge, E. Asanza, L. Werling, & S. Leth-Nissen 33885 (holotype US 2992326; isotype AAU), collected in primary forest on elevated ground east of tourist house, Lagunas de Cuyabeno, Prov. Napo, Ecuador, elev. 300 m, 22 Aug. 1981. "Tree 7 m. Flowers white."

Paratypes (all Napo, Ecuador, elev. 300 m, AAU, US): Rio Cuyabeno 1.5 km upstream from Puerto Bolívar, Brandbyge, Asanza, Werling, & Leth-Nissen 33746 ("Tree 8 m. Twigs and lower side of leaves brownish pubescent."); Lagunas de Cuyabeno, second lake 3 km west of first lake, Brandbyge, Asanza, Werling, & Leth-Nissen 33964 ("Tree 6 m. Flowers white. Anthers yellow"); Lagunas de Cuyabeno, NE part of first lake, Brandbyge, Asanza, Werling, & Leth-Nissen 36025 ("Tree 7 m. Petals white. Anthers yellow").

Miconia pubipetala (confined to the eastern and central Amazon-Orinoco drainage) has predominantly 5-merous flowers on pedicels 2-3 mm long, ovate calyx lobes, and 3-locular ovaries. Miconia amazonica Cogn. is also suggestive of M. hylophila, differing in the 7-nerved leaf blades, essentially truncate calyx, externally stellulate-puberulous petals, sparsely stellulate-puberulous filaments, and densely stellulate-lepidote ovary apex.

MICONIA HETEROCHAETA Wurdack, sp. nov.

M. hookerianae Triana distanter affinis, foliis anguste ellipticis petiolis brevioribus ramulorum pubescentia longiore inflorescentiae hypanthiique pubescentia p. glandulifera antheris hypanthiisque longioribus ovario vix infero differt.

Ramuli teretes sicut petioli inflorescentiae axis (basim versus) dense setosi pilis gracilibus laxis 5-7 mm longis ad apicem saltem pro parte stellatis et pilis stipitato-stellatis (stipite 2-3 mm longo) densissime setosi. Petioli 1(-1.5) cm longi; lamina 32-40 (vel ultra) X 5-9 cm anguste elliptica apice gradatim 5-6 cm acuminato basi 0.3-0.5 cm cordulata, chartacea et integra dense ciliata pilis stellatis, supra nervis primariis exceptis glabra, subtus in superficie modice stellato-setulosa pilis plerumque sessilibus ca (0.3-)0.5(-0.7) mm latis in nervis primariis dense setosa pilis gracillimis stipitato-stellatis usque ad 5 mm longis et densissime pilis stellatis sessilibus vel breviter stipitatis armata, 3-nervata nervis secundariis 0.7-1 cm inter se distantibus nervulis subtus laxè reticulatis areolis (0.5-)1 mm latis. Panicula 18-30 cm longa multiflora; flores 5-meri, pedicellis (0-)2 mm longis et plerumque ca 0.5 mm infra hypanthium articulatis, bracteolis ca 2 X 0.5-0.7 mm caducis. Hypanthium (ad torum) 4.5-5 mm longum sicut inflores-

centiae rami dense pilis stellatis sessilibus vel ad 0.5 mm stipitatis et modice pilis laevibus glanduliferis 0.3-1 mm longis ornatum; calycis tubus 0.9-1 mm longus, lobis interioribus 0.7-0.8 mm longis late ovatis rotundatis, dentibus exterioribus obscuris inframarginalibus; torus intus sparse glandulosus (0.1-0.2 mm). Petala 4.6-5 X 2.2-2.4 mm obovato-oblonga (apice paulo emarginato) extus granulosa et sparse stellato-puberula. Stamina in dimensionibus dimorphica, filamentis sicut stylo sparse glandulosis (0.1 mm), thecis subulatis ad basim ventraliter 0.4-0.5 mm prolongatis poro 0.1 mm diam., connectivis ad basim sparse glandulis debilibus 0.1-0.15 mm longis ornatis. Stamina maiora: filamenta 5-5.2 mm longa; antherae 6.2-6.5 X 0.5-0.7 X 0.5 mm, poro ventraliter inclinato. Stamina minora: filamenta 4 mm longa; antherae 5-5.3 X 0.5-0.6 X 0.5 mm, poro dorsaliter inclinato. Stigma non expansum; stylus 10-11 X 0.35-0.4 mm in ovarii apicem 0.8-0.9 mm immersus; ovarium 3-loculare 1/6-1/8 inferum apice modice glanduloso (0.15-0.2 mm).

Type Collection: Holguer Lugo 5431 (holotype GB; isotype US), collected at Saraquillo ca 5 km north of Sarayacu, Prov. Pastaza, Ecuador, 16 Aug. 1979. "Tree ca 4 m. Flowers white."

Paratypes (both Pastaza, Ecuador): H. Lugo 5508 (GB, US), trail to Copataza ca 10 km south of Sarayacu; H. Lugo 5636 (GB, US), Palta Playa 15 km north of Sarayacu ("Tree ca 3 m. Flowers white").

Miconia hookeriana has relatively broader leaf blades with acute to obtuse bases, petioles mostly 3-5 cm long, cauline hairs ca 1 mm long, eglandular inflorescence and hypanthial hairs, hypanthia 3-4 mm long, anthers 2.5-4.2 mm or 2-3.2 mm long with dorsally inclined pores and a rounded dorsal tooth, and ovary 1/2 inferior. Neither M. sessilifolia Naud. nor M. amplexicaulis Naud. (both with essentially sessile leaves and petals externally puberulous) seem as closely related to M. heterochaeta, nor do any of the species of Sections II-V of Cogniaux' arrangement. In the Flora of Ecuador, M. heterochaeta would key to near M. tomentosa (Rich.) Don ex DC., M. explicita Wurdack, and M. hookeriana; the first two species are not at all related to M. heterochaeta in pubescence or flowers. A probable close relative of M. heterochaeta, but with eglandular inflorescences and hypanthia, has been collected near Shaim in Amazonas, Peru, elev. 500 m (Berlin 444, fruiting).

MICONIA SUBSESSILIFOLIA Wurdack, sp. nov.

Sect. Miconia. M. stipitatae Gleason, M. cionotrichae Uribe, et M. mocquersii Wurdack affinis, foliis ubique in superficie glabris differt.

Ramuli teretes primum sicut foliorum subtus venae primariae basim versus inflorescentiaque sparse pilis stipitato-stellatis (stipite 0.1-0.5 mm longo) setulosi demum glabrati. Folia in quoque pari plus minusve disparilia (3:1-2.5); petioli 0.2-0.4 cm longi; lamina maior (7-)10-16 X (3-)4-8 cm oblongo-ovata apice per 1-2.5 cm gradatim hebeti-acuminato basi 0.2-0.5 cm cordata, chartacea et obscure distanterque undulato-serrulata eciliata,

ubique in venis secundariis venulis superficiei glabra, 5-nervata nervis secundariis 5-8 mm inter se distantibus nervulis sub-tus planis laxe reticulatis (areolis 1-2 mm latis). Panicula 5-11 cm longa submultiflora; flores 5-meri sessiles in ramulis interrupto-glomerati, bracteolis 1-1.5 X 0.4-0.6 mm oblongo-ellipticis caducis. Hypanthium (ad torum) 1.5-1.7 mm longum sparse et plus minusve caduce stellulato-puberulum; calycis tubus 0.5-0.6 mm longus, lobis interioribus 0.3-0.4 mm longis ovatis, dentibus exterioribus inframarginalibus vel lobos interiores aequantibus; torus intus glaber. Petala 3-3.2 X 0.8-1.5 mm obovato-oblonga granulosa extus interdum sparsissime stellulato-puberula. Stamina paulo dimorphica; filamenta 4-4.3 mm vel 3-3.2 mm longa glabra; thecae oblongo-subulatae poro 0.1-0.15 mm diam., connectivo non vel paullulo (0-0.2 mm) prolongato, ventraliter bilobulato hebeti. Stamina maiora: thecae 2.3-2.5 X 0.4 X 0.4 mm, poro ventraliter inclinato, connectivi appendice ventrali 0.4-0.5 mm longa glandulis stipitatis 4-8 ornata. Stamina minora: thecae 1.8-1.9 X 0.4 X 0.4 mm, poro terminali vel paululo dorsaliter inclinato, connectivi appendice ventrali 0.4 mm longa glandulis 2(-4) ornata. Stigma paullulo expansum 0.4 mm diam.; stylus 6.5 X 0.3 mm glaber in ovarii apicem 0.2 mm immersus; ovarium 3-loculare et 0.4-0.5 inferum apice sparsissime glandulis 0.05 mm longis ornatum.

Type Collection: Juan Hernández & Saulo Hoyos 61 (holotype HUA 13438; isotype US), collected at Río Samaná, San Luis, Medellín-Bogotá road, Antioquia, Colombia, elev. 480 m, 12 Oct. 1981. "Arbusto 1.5 m, escasa. Inflorescencia blanca, cáliz amarillo claro, corola blanca, estambres blancos; fruto baya roja."

Paratypes (all Antioquia, Colombia): Linda Albert de Escobar 3334 (HUA, US), 2.2 km east of Río Samaná bridge on Medellín-Bogotá road, Mun. San Luis, elev. 400 m ("Arbusto de frutos rojos"); Carlos A. Loaiza, Linda Escobar, & Saulo Hoyos 90 (HUA, US) ("Arbusto 3 m; flor blanca") and 102 (HUA, US) ("Arbusto; fruto morado") and Hernández & Hoyos 687 (HUA) ("Arbusto de 3 m"), all from Río Claro, Mun. San Luis, elev. 350-400 m; Hoyos, Escobar, & Girón 139 (HUA, US), Río Samaná-Río Claro, San Luis, elev. 700 m ("Arbusto de 1.5 m. Flores blancas. Común y creciendo en bosque primario perturbado"); J. Denslow 2337 (US) ("Small tree 15 ft. Fl. white with faint aroma") and 2467 (US) ("Shrub 4 m. Berries bright red, ridged"), both from near Planta Providencia 26 km south of Zaragoza in valley of Río Anorí between Dos Bocas and Anorí, elev. 400-700 m.

The suggested relatives all share the features of at least in part stipitate-stellate pubescence and glandular bases of the stamen connectives, but have pubescent leaf surfaces. The first two congeners have distinctly petiolate leaves; M. mocquersii, with essentially sessile leaves, has much denser inflorescence indument, larger bracts and flowers, external calyx teeth projecting 0.7-0.8 mm, and nearly truncate calyx limb. Other west Colombian species of Miconia with sessile leaves (M. cruenta Triana, M. anisophylla Triana) are not closely related to

M. subsessilifolia. Three of the collections (Hoyos 90, 102, and 139) of M. subsessilifolia have young leaves strongly purplish-tinted beneath; all the other material seems to have concolorous foliage.

HENRIETTELLA TACHIRENSIS Wurdack, sp. nov.

H. tuberculosae Donn. Smith et H. verrucosae Triana affinis, floribus bene pedicellatis antherarum connectivis magis prolongatis differt.

Ramuli teretes sicut foliorum petioli et laminarum venae primariae supra et subtus hypanthiaque modice strigulosi pilis ca 0.5(-1) mm longis. Petioli 1.5-2.3 cm longi; lamina (8-)13-16 X (3.5-)5-9 cm elliptica apice gradatim per ca 0.5-1.5 cm hebeti-acuminato basi acuta, chartacea et essentialiter integra vel minute serrulata appresso-ciliolata, supra sparsiuscule strigulosa (demum subverruculosa) pilis 0.4-0.8 mm longis ad basim expansis, subtus sparse strigulosa pilis gracilibus 0.3-0.5 mm longis, 5-plinervata pari interiore (1-)2-2.5 cm supra basim subalternatim divergenti nervis secundariis 2-4 mm inter se distantibus nervulis subtus planis areolis ca 1 mm latis. Flores 5-meri in ramulis infra folia oriundi ca 8-10 in quoque nodo, bracteolis basalibus ca 0.5 X 0.3 mm ovato-triangularibus, pedicellis 2.5-3.3(-5) mm longis. Hypanthium (ad torum) 2.6-2.7 mm longum; calyx 0.2-0.25 mm longus truncatus, dentibus exterioribus ca 0.3 mm eminentibus. Petala 2.2 X 2.1-2.2 mm ovata ca 0.5-0.7 mm unguiculata (apice rotundato-obtusum) intus glabra extus centraliter modice strigulosa pilis robustis ca 0.3 mm longis. Stamina isomorphica glabra; filamenta 3-3.1 mm longa; antherarum thecae 1 X 0.5 X 0.7 mm apice ca 0.2 mm emarginato, poro 0.5 mm diam.; connectivum 1.1 mm prolongatum dorsaliter ad basim dente obtuso 0.4 mm longo armatum. Stigma capitatum 1 mm diam.; stylus 5.7 X 0.35-0.4 mm glaber; ovarium 5-loculare et omnino inferum ad apicem sparse setulosum (0.2 mm).

Type Collection: Luis Marciano Berti & Ismael Peña 168-980 (holotype US 2968516; isotype MER), collected in humid submontane forest along the Palo Grande-Minas de Carbón de Lobatera road, Parque "Cazadero," Municipio Lobatera, Edo. Táchira, Venezuela, 11-10-1980. "Arbolito de 6 m de alto por 10 cm de diam. Flores blancas."

Paratypes (both Táchira, Venezuela): Steyermark & Liesner 118710 (US, VEN, in young bud), from forested slopes near Mata Mula north of Delicias on road to Bramon, elev. 1750 m, 26 July 1981 ("Shrub 2 m tall; leaves membranous, deep green above, paler green below with raised nerves; calyx pale green"); Liesner & Guariglia 11805 (MO, US, VEN, fruiting), from Quebrada Cazadero 16 km NW of San Cristobal, elev. 650-900 m, 4 May 1981 ("4 m tree, fruit green, becoming orange, and then red").

Both suggested relatives have pedicels to only ca 1 mm long and connectives basally prolonged 0.2-0.25 mm below the thecae; neither species has prominently strigulose petals although both have infra-apical mucros. In H. verrucosa, the oblong anther thecae are ca 2 X 0.6 mm with a small pore, the stigma promi-

nently expanded; in *H. tuberculosa*, the anther pore is broad, but the stigma is only 0.4 mm wide. *Henriettella trachyphylla* Triana was described as with 4-merous flowers; several Sierra Nevada de Santa Marta collections (including Kirkbride 2221) have the vegetative facies of the Triana type collection, but 5-merous flowers with petal pubescence as in *H. tachirensis*. This Magdalena population differs from the Venezuelan novelty in the patent cauline and lower leaf surface pubescence and short anther connective prolongation. Fosberg 19124 (US, fruiting), from hills east of Río Valegra, Norte de Santander, elev. 2000 m, may represent a Colombian population of *H. tachirensis*; the leaves, however, are somewhat smaller and relatively wider.

LEANDRA CREMERSII Wurdack, sp. nov.

Sect. *Secundiflorae*. *L. francavillanae* Cogn. in aspectu similis, foliis supra glabris, ovario triloculare glabro, fructurum pilis pro parte glanduliferis differt.

Frutex 0.75-2 m; ramuli teretes sicut petioli inflorescentiaeque dense strigosi pilis laevibus eglandulosis gracillimis ca 1-2 mm longis. Petioli (1.5-)2-3(-4) cm longi; lamina (5-)10-15 (-18) X (2.5-)4-5(-6) cm elliptico-lanceata apice gradatim acuminate basi late acuta, chartacea et integra dense appresso-ciliata (pilis gracillimis 2-4 mm longis), supra per costam strigosa (pilis gracillimis ca 2 mm longis) alioqui glabra, subtus dense vel modice sericeo-strigosa (pilis gracillimis ca 3-4 mm longis) et modice appresso-setulosi (pilis gracillimis ca 0.3 mm longis), 5-nervata nervis secundariis 2-3 mm inter se distantibus nervulis subtus planis obscuris areolis ca 0.4 mm latis. Panicula 14-25 cm longa oblonga, ramis oppositis 0.5-2 cm longis; flores 5-meri in ramulis secundi subsessiles (pedicellis ca 0.3 mm longis), bracteolis 1.5-2 X 0.3 mm acuminatis persistentibus. Hypanthium (ad torum) ca 1.5 mm longum densiuscule laxequae strigosum pilis gracillimis ca 2 mm longis eglandulosis (pilis glanduliferis brevibus ad anthesim occultis); calycis tubus 0.2 mm longus, lobis interioribus ca 0.8 X 0.7 mm oblongis apice hebeti-acuto, dentibus exterioribus setuliferis 0.1-0.2 mm eminentibus. Petala glabra lanceata acuminata 3-3.1 X 0.6-0.7 mm. Stamina isomorpha glabra; filamenta 2.7 mm longa; antherarum thecae 1.6 X 0.3 X 0.35 mm anguste oblongae, poro ca 0.1 mm ventraliter inclinato, connectivo non vel vix (0.05 mm) prolongato non appendiculato. Stigma non expansum; stylus 5 X 0.2-0.1 mm glaber in ovarii collo ca 0.2 mm immersus; ovarium 3-loculare et 5/6 inferum apice glabro; hypanthium fructiferum sparse pilis glanduliferis ca 0.5 mm longis setuliferum.

Type Collection: G. Cremers 8201 (holotype CAY), collected at "bord de piste entre Citron et le Mont Décou Décou" near Paul Isnard, French Guiana, 10-9-1983. "Arbuste. Fleurs à pétales triangulaires blancs. Etamines à anthère jaune."

Paratypes: French Guiana (all fruiting, Massif Décou Décou, Paul Isnard region, elev. 350-400 m): Cremers 7923 (CAY), 8172 (CAY, US), 8197 (CAY, US), de Granville 5289 (CAY), 5328 (CAY, US). Brazil: near Cachoeira Macacoara, Rio Jari, Terr. Amapa,

elev. 200 m, W. A. Egler & H. S. Irwin 46689 (NY, US).

Leandra francavillana has upper leaf surfaces minutely strigulose, ovaries 5-celled and puberulous at the apex, and fruiting hypanthia lacking glandular hairs. All of the 5-merous species of Leandra Sect. Secundiflorae with 3-celled ovaries treated in the Melastomataceae of Venezuela and Ecuador have strigulose to strigose upper leaf surfaces; of these, much of the material of L. sanguinea Gleason has similar sericeous pubescence on the leaves beneath (but the margins serrulate).

LEANDRA CLIDEMIOIDES (Naud.) Wurdack, comb. nov.

Platycentrum clidemioides Naud., Ann. Sci. Nat. ser. 3, Bot. 18: 114. 1852.

LEANDRA CLIDEMIOIDES (Naud.) Wurdack subsp. ECUADORENSIS (Wurdack) Wurdack, comb. nov.

Platycentrum clidemioides Naud. subsp. ecuadorensis Wurdack, Phytologia 18: 149. 1969.

LEANDRA CLIDEMIOIDES (Naud.) Wurdack subsp. BOLIVIENSIS (Wurdack) Wurdack, comb. nov.

Platycentrum clidemioides Naud. subsp. boliviensis Wurdack, Phytologia 18: 149. 1969.

LEANDRA COADUNATA Wurdack, sp. nov.

L. clidemioidi (Naud.) Wurdack affinis, inflorescentiae pilis pro parte glanduliferis petalis minoribus differt.

Ramuli teretes sicut foliorum supra et subtus venae primariae inflorescentiaque densiuscule laxo-strigulosi pilis laevibus 0.5-1 mm longis. Petioli (0.5-)1-2 cm longi; lamina (8-)12-19 X (3-)4-7 cm elliptica vel oblongo-elliptica apice gradatim per 1-2 cm acuminato basi acuta, chartacea et subintegra vel obscure crenulato-serrulata ciliolata, supra sparse strigulosa pilis laevibus gracilibus 0.3-0.5 mm longis, subtus sparsiuscule vel modice appresso-setulosa pilis laevibus gracillimis ca 0.5 (-1) mm longis, breviter (0.5-1 cm) 5-plinervata nervis secundariis 3-5 mm inter se distantibus. Panicula 10-16 cm longa multiflora (ramis primariis 2 vel 4 in quoque nodo) pilis glanduliferis 0.5-0.7 mm longis sparse induta; flores 5-meri, bracteolis subulatis setuliferis ca 0.4 mm longis subsistentibus, pedicellis supra bracteolas 0.1-0.3 mm longis. Hypanthium (ad torum) 1.6-1.7 mm longum densiuscule appresso-setulosum pilis gracilibus 0.3-0.5 mm longis pilis glanduliferis ca 0.5 mm longis sparse intermixtis; torus intus modice glanduloso-setulosus (0.1 mm); calycis tubus 0.1 mm longus, lobis interioribus 0.2-0.3 mm longis ovatis ad basim remotis, dentibus exterioribus setulosis lobos interiores aequantibus vel paullulo (0.1 mm) superantibus setula ca 0.4 mm longa terminatis. Petala 0.5-0.6 X 0.2 mm obovato-oblonga esetulosa granulosa ad margines furfuraceo-erosula. Stamina paulo dimorphica glabra, filamentis 1-1.2 mm longis, antheris lanceatis, poro ventraliter inclinato 0.1 mm diam., connectivo non prolongato. Stamina maiora: thecae 1.5-1.8 X

0.25-0.3 mm, connectivo dorsaliter dente hebeti ascendentis 0.6 mm longo 0.2 mm elevato et 0.2 mm libero armato. Stamina minora: thecae 1.5-1.7 X 0.3-0.35 mm, connectivo dorsaliter ad basim obscure elevato non appendiculato. Stigma non vel obscure expansum; stylus 4-4.6 X 0.15-0.2 mm glaber in ovarii apicem ca 0.1-0.2 mm immersus; ovarium 3-loculare et obscure (0.1-0.2) inferum apicem versus sparse glanduloso-puberulum (0.05-0.1 mm).

Type Collection: G. T. Prance & A. E. Prance 20962 (holotype INPA 44938; isotypes NY, US), collected on terra firme at Km 32, Manaus-Caracarai Road, Amazonas, Brazil, 12 April 1974. "Shrub 3 m tall. Inflorescence purple."

Paratypes (all Amazonas, Brazil): J. G. Kuhlmann 983 (RB, US), Uypiranga, Rio Negro near Manaus, 22 Dec. 1923 ("Arbusto de um metro, fl. esverdeada; estames amarelos, infl. purpura"); M. F. Silva, R. Lisboa, I. Leite, D. Coêlho, & J. Ramos 2047 (INPA), 13 Jan. 1977 ("Arbusto 1,50 m altura no limite da mata com a capoeira, solo argiloso; inflorescência roxa"), M. Silva 36 (INPA, US), Jan. 1972 ("Arbusto de 1,50 m de altura; flores com pétalas roxas"), and M. Silva & D. Coêlho 61 (INPA, US), 22 Feb. 1972 ("Arbusto de 1,5 m de altura; inflorescência roxa, estames amarelos"), all from Reserva Florestal W. Egler, Km 62-64 of Manaus-Itacoatiara Road; Aline de Castro e Santos & Angelo Augusto dos Santos 526 (INPA, US), 20 July 1982 ("Arbusto do capoeira, atingindo 2 m de altura. Sobre solo arenoso") and W. Rodrigues, L. Coêlho, & D. Coêlho 8401 (INPA, US), 19 Feb. 1968, both from Estrada Torquato Tapajós, Km 70 between Manaus and Itacoatiara; Arthur, Osmarino, Dionísio, & Luna INPA 48.272 (INPA), Estrada Torquato Tapajós, Km 132, 18 Mar. 1975 ("Arbusto de 2 metros; frutos maduros arroxeados").

As earlier indicated (Flora de Venezuela 8: 715. 1973), only the dorsal ascending appendage on the anther connective could be used as a generic distinction between Platycentrum and Leandra; several species of Leandra Sect. Tschudya (L. micropetala Cogn., L. purpurea Gleason, L. subobruta Wurdack) have seeds like those of L. coadunata. In its combination of minute petals, glandular pubescence, and dorsally appendaged large anthers, L. coadunata effectively bridges the gap between Platycentrum and Leandra Sect. Tschudya. Leandra clidemioides lacks glandular pubescence and has petals (0.8-)1.4-2 mm long. Leandra glandulifera (Triana) Cogn. (see Flora de Venezuela 8: 712-713) resembles L. coadunata, but has more patent hairs on the branchlets and primary leaf veins beneath, somewhat more obviously denticulate leaf blades, longer external calyx teeth, larger stamens with no dorsal appendage, and broader petals. The typical subspecies of L. clidemioides is now known from Peru (Huánuco, Castillo Alto west of Tingo Maria, elev. 800 m, Plowman 5856).

TOPOBEA ALBERTIAE Wurdack, sp. nov.

T. durandianae Cogn. et T. maurofernandezianae Cogn. affinis, foliorum laminis ad apicem rotundato-emarginatis petalis staminibusque maioribus ovariis (3-)4-locularibus apice glabro et truncata (collo non evoluto) differt.

Ramuli primum quadrangulares demum teretes sicut folia novella primum strigulosi pilis mox deciduis. Petioli (2-)3-4 cm longi; lamina (9-)11-17(-19) X (6-)8-10(-12) cm elliptica apice rotundato-emarginato (interdum 1-2 mm hebeti-cuspidato) basi late acuta vel obtusa, coriacea et integra, breviter (0.3-0.5 cm) 5-plinervata (pari tenui 1-2 mm inframarginali incluso) nervis secundariis principalibus 2(-3) mm inter se distantibus subtus paulo elevatis. Flores 6-meri in quoque nodo superiore (4-)6-10(-12); pedicelli ad anthesim 10-18(-28) mm longi; bractae firmae suboblatae extus sparse inconspicueque puberuli (pilis laxis 0.5-1 mm longis caducis) fimbriato-ciliolatae (0.2-0.3 mm) nervis non evidentis apice truncato-rotundato; bractae exteriores 9-10 X 9-12 mm ad basim 2.5-3 mm coalitae et verrucosae; bractae interiores 11 X 11-12 mm liberae. Hypanthium (ad torum) 4.7-5 mm longum essentialiter glabrum; calyx 7-8 mm longus truncatus ultra bracteis interiores 2-3 mm eminens, dentibus exterioribus obsoletis; torus intus sparse glandulosus (0.1 mm). Petala 24.5-28 X 14-19 mm obovata apice truncato-rotundato densiuscule obscureque ciliolata (0.1 mm) alioqui glabra. Filamenta 14-17 mm longa; antherae lateraliter inter se cohaerentes 13-14 X 2-2.5 X 1 mm oblongo-subulatae poris 0.6 mm diam. coalitis dorsaliter inclinat; dens basalis 2.3 mm longus acutus patens. Stigma 0.3-0.5 mm diam. vix expansum; stylus 17.5-20 X 0.6-0.3 mm glaber; ovarium (3-)4-loculare glabrum 1/7-1/14 inferum apice 1.5-2 mm protracto truncato.

Type Collection: Linda Albert de Escobar, Dario Sánchez, & Wilson Rengifo 2278 (holotype HUA 016159; isotype US), collected at the Fincas Montepinar and Las Palmas, Vereda Quebrada Larga, Municipio Guatapé at the line with Mun. San Rafael, Antioquia, Colombia, elev. 1800 m, 4 Sep. 1982. "Arbol de 8 m de flores blancas muy perfumadas, anteras amarillas."

Paratype (topotypical): Escobar, Sánchez, & Rengifo 2257 (HUA, US). "Arbol 8 m de flores blancas y anteras amarillas, huelle profundo por la noche."

Both Central American relatives have leaf blades apically rather gradually or abruptly acuminate, petals up to 17-18.5 mm long (and less notably clawed), anthers up to 9.7 mm long, basal connectives blunt and usually snorter, and 6-celled ovaries with a glandular-puberulous collar 1-1.3 mm long around the style base. I am as uncertain as Louis Williams (Fieldiana Bot. 29: 583. 1963) as to the distinctness of these two northern taxa; Pittier (Tonduz) 1844 (US) and Tonduz 4969 (US), determined by Cogniaux as the two Costa Rican species, both have similar foliage and ovarian collars (petals and stamens lacking). Two Panamanian collections (Correa & Dressler 700, Cerro Azul, Panamá; Gentry, Leon, & Forero 16841, Serranía del Darién, Darién) possibly are referable to T. albertiae, but the material is too incomplete for positive identification.

ADDITIONAL NOTES ON THE *ERIOCAULACEAE*. XCVII

Harold N. Moldenke

SYNGONANTHUS FLAVIPES Mold.

Additional bibliography: Mold., *Phytologia* 55: 108. 1984.

Huber & Tillett describe this as growing to 30 cm. tall and found it "rather frequent" on savannas, as 120 m. altitude, in flower in December.

Additional citations: VENEZUELA: Amazonas: O. Huber 1625 (Ld), 2056 (Ld), 6084 (Ld); Huber & Tillett 2785 (Ld), 2943 (Ve); Huber, Tillett, & Davidse 3645 (Ld); Maguire, Cowan, & Wurdack 30465 (W--2046497--isotype); Thomas & Rogers 2607 (N); Wurdack & Adderley 42860 (W--2320878).

SYNGONANTHUS FLEXUOSUS Alv. Silv.

Additional bibliography: Mold., *Biol. Abstr.* 64: 6581. 1977; Mold., *Phytologia* 36: 61 & 62 (1977) and 38: 44. 1977; Mold., *Phytol. Mem.* 2: 154 & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv. Fl. Mont. 1: 393--395, pl. 252. 1928 (Ld, N, W).

SYNGONANTHUS FLOCCOSUS Mold., *Phytologia* 45: 478, pl. 5. 1980.

Bibliography: Mold., *Phytologia* 45: 477--478, pl. 5. 1980; Mold., *Phytol. Mem.* 2: 165 & 623. 1980.

Illustrations: Mold., *Phytologia* 45: 477, pl. 5. 1980.

Citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19042 (Ld--type, N--isotype, W--2936306--isotype).

SYNGONANTHUS FUSCESCENS Ruhl.

Additional bibliography: Mold., *Biol. Abstr.* 64: 6581. 1977; Mold., *Phytologia* 37: 69. 1977; Mold., *Phytol. Mem.* 2: 165 & 623. 1980.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 30214 (W--2706046).

SYNGONANTHUS GARIMPENSIS Alv. Silv.

Additional bibliography: Mold., *Biol. Abstr.* 64: 6581. 1977; Mold., *Phytologia* 36: 62. 1977; Mold., *Phytol. Mem.* 2: 165 & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 317--319, pl. 201 & 202. 1928 (Ld, N, W).

SYNGONANTHUS GLABER Alv. Silv.

Additional bibliography: Mold., *Biol. Abstr.* 64: 6581. 1977; Mold., *Phytologia* 36: 61 & 62 (1977) and 38: 44. 1977; Mold., *Phytol. Mem.* 2: 165 & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 388--390, pl. 248. 1928 (Ld, N, W).

SYNGONANTHUS GLANDULIFER Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 36: 62--63. 1977; Mold., Phytol. Mem. 2: 165 & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 321--322, pl. 204. 1928 (Ld, N, W).

SYNGONANTHUS GLANDULOSUS Gleason

Additional bibliography: Mold., Phytologia 42: 38 & 42 (1979) and 44: 384. 1979; Mold., Phytol. Mem. 2: 111, 119, 123, 125, 165, 179, 443, 444, & 623. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980; Reis & Lipp, New Pl. Sources Drugs 22. 1982; Mold., Phytologia 54: 237 & 439 (1983) and 55: 65, 88, & 89. 1984.

Maguire & Wurdack report this plant "occasional" in morichal, at 300 m. altitude, the fruiting-heads described as white in May. The Maguire and Wurdack collection which is cited below was previously regarded by me as representing the related *S. caulescens* (Poir.) Ruhl. since some of the plants show stem elongations of 1--5 cm. and the sheaths are hirsutulous.

The Cowan & Soderstrom 2154, distributed as typical *S. glandulosus*, actually is its f. *epapillosus* (Mold.) Mold.

Additional citations: VENEZUELA: Bolívar: Maguire & Wurdack 36752 (N, W--2168958); J. A. Steyermark 58621 (W--1901778).

SYNGONANTHUS GLANDULOSUS f. *EPAPILLOSUS* (Mold.) Mold., Phytologia 44: 384. 1979.

Synonymy: *Syngonanthus glandulosus* var. *epapillosus* Mold., Phytologia 26: 177--178. 1973.

Bibliography: Mold., Phytologia 26: 177--178. 1973; Anon., Biol. Abstr. 56 (10): B.A.S.I.C. S.265. 1973; Mold., Biol. Abstr. 56: 5366. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974; Mold., Phytologia 28: 437--440 (1974), 35: 359 (1977), 36: 36 & 65--66 (1977), and 37: 87, 88, & 270. 1977; Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 42: 38 & 42 (1979) and 44: 384. 1979; Mold., Phytol. Mem. 2: 119, 123, 125, 165, 179, 443, & 623. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980; Mold., Phytologia 54: 237 & 439. 1983.

Recent collectors describe this plant as a rosette herb to 20 cm. tall and have encountered it in a region of "waterworn horizontally bedded sandstone at soil surface, with damp sand, sedge marsh, exposed rock, and waterfalls, the vegetation consisting of open scrub to closed low woodland in the drier areas" and among "vegetación arbustiva y herbácea sobre una laja granítica detrás de un gran préstamo de arena", in morichal, at the edges of lakes, on wet sandstone banks along small streamlets, and in grassy-sedgy dried-up rills, at 60--1220 m. altitude, in both flower and fruit in November and from January to March. Cowan & Soderstrom refer to it as locally common in boggy patches on top of rocks in the constant mist from waterfalls; the Maguires describe it as a locally frequent annual in marshy places along streams, while

Prance and his associates found it growing in small groups in damp swampy ground.

Collectors refer to the leaves as dull-green and the heads as white. The sheaths apparently are not hirsute. The vernacular name, "poma-taca", has been reported for the plant. The Egler collection, cited below, is a mixture with *Paepalanthus leucocyaneus* f. *egleri* Mold. and *Utricularia* sp.

Material of *S. glandulosus* f. *epapillosus* has been misidentified and distributed in some herbaria as *S. caulescens* (Poir.) Ruhl. and *S. huberi* Ruhl. The exact status of these taxa needs further critical evaluation.

Additional citations: VENEZUELA: Amazonas: Huber & Cerda 1435 (Ve). Apure: Davidse & González 14600 (E--2712479). Bolívar: J. A. Steyermark 60494 (N, W--1987437), 98198 (Ld, W--2621689); Steyermark & Liesner 127315 (Ld). GUYANA: Cowan & Soderstrom 2154 (Fg, N, W--2678029). BRAZIL: Amapa: Egler 47650 in part (W--2435286). Bahia: Harley, Mayo, Steerr, Santos, & Pinheiro in Harley 19281 (Ld, N). Mato Grosso: Eiten & Eiten 9145 (W--2971859). Paraná: Mattos 4365 (N). Roraima: Maguire & Maguire 40100 (N, W--2169030); Prance, Forero, Pena, & Ramos 4488 (Ld, N, S, W--2576789).

SYNGONANTHUS GLAUCUS Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 36: 66--667. 1977; Mold., Phytol. Mem. 2: 165 & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 373-374, pl. 237. 1928 (Ld, N, W).

SYNGONANTHUS GOYAZENSIS (Körn.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 89. 1979; Mold., Phytologia 42: 42. 1979; Mold., Phytol. Mem. 2: 165 & 623. 1980.

Recent collectors refer to this plant as an aquatic herb with white inflorescences and found it in fruit in August.

Additional citations: BRAZIL: Distrito Federal: Héninger, Paula, Mendonca, & Salles 610 (N). Goiás: G. Gardner 4384 (W--937204--isotype, W--1066874--isotype).

SYNGONANTHUS GOYAZENSIS var. *HATSCHBACHII* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 89. 1979; Mold., Phytologia 42: 42. 1979; Mold., Phytol. Mem. 2: 165 & 623. 1980.

Additional citations: BRAZIL: Goiás: Hatschbach 40064 (N--isotype, W--2850770--isotype).

SYNGONANTHUS GRACILIS (Bong.) Ruhl.

Emended synonymy: *Syngonanthus gracilis* Körn. apud Ruhl. in Wettstein, Denkschr. K. Akad. Wiss. Wien Math.-Nat. 79: 87. 1908.

Additional & emended bibliography: Bong., Mem. Acad. Imp. Sci. St.-Petersb., ser. 6, 1: 634--635. 1831; Ruhl. in Wettstein,

Denkschr. K. Akad. Wiss. Wien Math.-Nat. 79: 87. 1908; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Hocking, Excerpt. Bot. A.23: 388 (1974) and A.31: 17. 1978; Mold., Phytologia 42: 42--44, 199, & 202. 1979; Mold., Phytol. Mem. 2: 111, 112, 119, 120, 123, 125, 126, 165, 166, 172, 180, 398, 424--427, 443, & 623. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980; Hocking, Excerpt. Bot. A.36: 22. 1981; Mold., Phytologia 50: 248, 263, & 264 (1982), 54: 144, 235, & 237 (1983), and 55: 79, 84, & 85. 1984.

Recent collectors describe this plant as a small herb, growing in clumps, the leaves dark- or dull-green, and the inflorescence heads "pale", "creamy", "whitish", "white", or "pale white". They have found it growing along moist creek margins, on rocky outcrops along rivers, in sand with full exposure to the sun, in the transition area from swamp to savanna, in crevices in rock outcrops, on moist savannas, along rivulets on savannas, forming colonies in wet depressions on savannas, and "in moist sandy depressions among rocky exposures by cascades", at 130--1600 m. altitude, in both flower and fruit in May, October, and November, in fruit alone in April and December. Davidse and his associates encountered it in "open treeless areas on wet white-sand savannas dominated by *Lagenocarpus* and *Axonopus* species interspersed with tree and shrub islands".

Tillett describes what he calls the "bract at base of scape" [sheath?] dark-brown, the scape [peduncle] light-green, the "bracts of the inflorescence" [receptacular bracts] tan, and the flowers whitish. He reports the plant "frequent in small clumps in wet sand and gravel near river" in an area "covered with a 1 m. [tall] dense growth of grass, herbs, and some low shrubs".

Ruhland (1908) cites a Wackett and a Wettstein unnumbered collection from São Paulo.

The *Steyermark* & al. 123948, distributed as typical *S. gracilis*, seems better regarded as representing its var. *hirtellus* (Steud.) Ruhl., while Casas & Molero FC.3822 is *S. nitens* var. *koernickei* Ruhl. Murça Pires & Black 2464 is a mixture with *Cyperus* sp.

Additional citations: VENEZUELA: Amazonas: O. Huber 2231 (Ve); 3460 (Ld); Maas & Huber 5136 (N); Phelps & Hitchcock s.n. (N); Steyermark, Maas, Field, & Redmond 123631 (Ld), 123634 (Ld), 123635 (Ld), 123645 (Ld); Steyermark & Redmond 117070 (Ld). Bolívar: Moore, Ambrose, Dietz, & Pfister 9733b (Ba--385816); Steyermark, Berry, Dunsterville, & Dunsterville 117256 (Ac); Steyermark, Espinosa, Dunsterville, & Dunsterville 117812 (Ld); Steyermark & Maas 123729 (Lc); W. W. Thomas 2716 (N). GUYANA: Maas, Westra, & al. 3685 (Ld, N); Tillett & Tillett 45745 (N). BRAZIL: Amazonas: Madison, Kennedy, Monteiro, & Braga 6224 (N); Prance 23528 (N). Maranhão: Murça Pires & Black 2464 in part (W--2221498). Minas Gerais: G. Gardner s.n. (W--1625291). Pará: Davidse, Rosa, Rosário, & Silva 17592 (N); Plowman, Rosa, & Rosário 9718 (Ld, N, W--2967827).

SYNGONANTHUS GRACILIS var. *AMAZONICUS* Ruhl.

Additional bibliography: Mold., Phytologia 42: 43. 1979; Mold., Phytol. Mem. 2: 165, 172, & 623. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980.

Recent collectors have described this plant as a slender herb, to 10 cm. tall, the leaves light- or pale-green, the heads white, and the involucre bractlets stramineous or "golden-green". They have found it growing in a sandy flush along roadsides in a region of "sandstone rocks intersected by small streams and with some disturbed areas along roadsides" and on "rocky riverside with rapids, riverine vegetation, cerrado with sandstone outcrops and some grassland areas subject to flooding", at 700--980 m. altitude, in both flower and fruit in February and March.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18695 (K), 20105 (N). Pará: Martinelli 7311 [R.B. Herb. 203516] (Ld, W--2992746).

SYNGONANTHUS GRACILIS var. *ARAXAENSIS* Alv. Silv.

Additional bibliography: Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 36: 77. 1977; Mold., Phytol. Mem. 2: 165 & 623. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 347. 1928 (Ld, N, W).

SYNGONANTHUS GRACILIS var. *AUREUS* Ruhl.

Additional synonymy: *Syngonanthus gracilis* var. *aurens* Ruhl. ex Mold., Phytologia 50: 264 in syn. 1982.

Additional bibliography: Mold., Phytologia 42: 43. 1979; Mold., Phytol. Mem. 2: 119, 165, 172, & 623. 1980; Mold., Phytologia 50: 264 (1982), 54: 235 (1983), and 55: 85. 1984.

Recent collectors describe this plant as an herb, 20 cm. tall, with white inflorescence heads, and have found it growing in morichal and incipient morichal, "common" on white-sand savannas, and on "treeless savannas dominated by *Axonopus*, *Paspalum*, *Panicum*, and in spots by *Rapateaceae*, at 100--1300 m. altitude, in both flower and fruit in July, September, and December.

The Maguire & al. collection, cited below, was previously incorrectly reported as *S. biformis* (N. E. Br.) Gleason.

Additional citations: VENEZUELA: Bolívar: Davidse, Ramia, & Montes 4826 (E--2993651). Guárico: Delascio, Montes, & Davidse 11056 (E--2993687), 11614 (E--2994264). GUYANA: Maguire, Maguire, & Wilson-Browne 46179a (N). BRAZIL: Bahia: Mattos Silva & Brito 971 (Ld). Goiás: Murça Pires & Santos 16211 (N). Minas Gerais: G. Gardner 5270 (Ld--photo of cotype, W--1067055--cotype).

SYNGONANTHUS GRACILIS var. *BOLIVIANUS* Ruhl.

Additional bibliography: Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 36: 79--80 & 83. 1977; Mold., Phytol. Mem. 2: 175 & 623. 1980.

Beck describes this plant as growing to 8 cm. tall, and found it growing on wet savannas, in both flower and fruit in July.

Additional citations: BOLIVIA: El Beni: S. G. Beck 5497 (Ld). Santa Cruz: Kuntze 455 (Ld--photo of type).

SYNGONANTHUS GRACILIS var. *GLABRIUSCULUS* Ruhl.

Additional bibliography: Mold., Phytologia 42: 43--44 & 202. 1979; Mold., Phytol. Mem. 2: 119, 125, 126, 165, 443, & 623. 1980; Mold., Phytologia 54: 144. 1983.

Recent collectors describe the inflorescence heads of this plant as white, and have encountered it on savannas, in wet marshy savannas leading to morichal, and "among sandstone rocks and open scrub on rocky hillsides", at 70--1100 m. altitude, in both flower and fruit in February and November.

Material of this taxon has been misidentified and distributed in some herbaria as *Paepalanthus* sp.

Additional citations: VENEZUELA: Amazonas: Steyermark, Guariglia, Holmgren, Luteyn, & Mori 126134 (Ld); Thomas & Rogers 2678 (Ld). Apure: Davidse & González 14151 (Ld). Bolívar: Huber, Alarcon, & Davidse 6854 (Ld). FRENCH GUIANA: Granville 2611 (Cy); Hook 512 (Cy, Cy). BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18761 in part (N).

SYNGONANTHUS GRACILIS var. *GRISEUS* Ruhl.

Additional bibliography: Mold., Biol. Abstr. 64: 6581. 1977; Mold., Phytologia 36: 82 & 83. 1977; Mold., Phytol. Mem. 2: 166 & 623. 1980.

SYNGONANTHUS GRACILIS var. *HIRTELLUS* (Steud.) Ruhl.

Additional bibliography: Mold., Phytologia 42: 44. 1979; Mold., Phytol. Mem. 2: 119, 166, 425, & 623. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980; Mold., Phytologia 50: 248 (1982), 54: 235 (1983), and 55: 84. 1984.

Recent collectors describe this plant as a slender herb, to 20 cm. tall, with small basal rosettes of gray leaves, "pale" involucre bracts, and white or cream-colored flowering heads. They have encountered it on natural campos, "among sandstone rocks and open scrub on hillsides", in disturbed soil of sandy savannas, in periodically burned cerrado "entre o capim", in brejo and morichal, in brejo-like areas in cerrado, in moist open sandy places among rocks, and in "open scrub on white sand with damp areas and extensive sedge meadows partly burned over", at 62--1200 m. altitude, in both flower and fruit in January, February, April, July to September, and December. Huber and his associates refer to it as "frequent". Steyermark and his associates make the interesting statement regarding their no. 123948 that it grew "in dense clumps, all green", while their no. 123922 grew "in denser mats with gray centers". Raynal-Roques describes the plant as a "très petite rosette étalée sur le sol, issue d'une souche pérenne; feuilles à longs poils blancs; scapes filiformes portant des capitules blancs." Poole calls it a "common annual to 25 cm. tall, the heads grayish-white".

Additional citations: VENEZUELA: Amazonas: Cardenas & Pykkö

1396 (Ve). Amazonas: Steyermark, Maas, Field, & Redmond 123620 (Ld). Bolívar: Huber, Rodríguez, & Alarcon 7342 (Vo); Steyermark, Maguire, Brewer-Carías, Maguire, & Espinosa 123922 (N), 123948 (N). Guárico: Delascio, Montes, & Davidse 11259 (Ld), 11498 (Ld, Ld), 11580 (Ld, Ld). FRENCH GUIANA: Raynal-Roques 19731 (Cy). BRAZIL: Amazonas: Poole 1793 (N). Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18761 in part (K), 18848 (N); Mattos Silva, Carvalho, & Hage 1029 (Ld); Mori, Mattos Silva, & Santos 10503 (N), 10613 (N), 10615 (N), 10616 (N); Santos, Mori, & Mattos Silva 3351 (Ld). Distrito Federal: Héring, Figueiras, Mendonça, Pereira, Salles, & Silva 4420 (E--2904852); Héring, Salles, & Mendonça 17403 (N). Goiás: Pereira 466 (Ld). Mato Grosso: Murça Pires & Santos 16337 (N); Prance & Schaller 26246 (Ld, N). Pará: Prance, Pennington, & Murça Pires 1283 in part (W--2514723).

SYNGONANTHUS GRACILIS var. *KOERNICKEANUS* Ruhl.

Additional synonymy: *Paepalanthus gracilis* var. *koernickeanus* Ruhl. ex Mold., *Phytologia* 50: 263 in syn. 1982.

Additional bibliography: Hocking, Excerpt. Bot. A.31: 17. 1978; Mold., *Phytologia* 42: 44. 1979; Mold., *Phytol. Mem.* 2: 111, 119, 123, 125, 126, 166, 424, 425, & 623. 1980; Mold., *Phytologia* 50: 263 (1982) and 55: 79. 1984.

Recent collectors describe this as a very small, delicate plant, often forming dense cushions. They have found it growing on white-sand savannas, along creeks in low forests, abundant on white-sand campinas, and in "sandy openings in valley with *Mauritia* bordering Pakaraima forest", at 450--1150 m. altitude, in both flower and fruit in June and December.

The variety appears to be very variable in height (length of peduncles) -- Schultes & al. 18093 is a good example of the tall form, while Steyermark 89686 well represents the dwarf form.

The Steyermark & Nilsson 638 and Steyermark & Pruski 121065 collections, distributed and previously cited as this variety, actually are *S. albopulvinatus* (Mold.) Mold.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18093 (W--2198892). VENEZUELA: Bolívar: J. A. Steyermark 89686 (W--2430066, W--2486395); Steyermark, Espinosa, Dunsterville, & Dunsterville 117754 (Ld). GUYANA: Maas, Mennega, Welle, & Groen 5832 (Ld); Maas, Westra, & al. 4410 (Ld, N). BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2578 (Ld).

SYNGONANTHUS GRACILIS var. *LATIFOLIUS* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 388. 1974; Mold., *Phytologia* 37: 72. 1977; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

SYNGONANTHUS GRACILIS var. *LUETZELBURGII* Herzog

Additional bibliography: Mold., *Phytologia* 37: 72. 1977; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

Recent collectors have encountered this plant on campo rupestre

at 1600--1850 m. altitude, in both flower and fruit in July.

Additional citations: BRAZIL: Bahia: *Mori, King, Santos, & Hage* 12480 (Ld, W--2854255).

SYNGONANTHUS GRACILIS var. *PALLIDUS* Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Mold., Phytologia 37: 72--73. 1977; Mold., Phytol. Mem. 2: 120, 166, & 623. 1980.

Knuth (1927) cites only the type collection, *Passarge & Selwyn* 258, from Bolívar, Venezuela.

SYNGONANTHUS GRACILIS f. *PROLIFER* Mold.

Additional bibliography: Mold., Phytologia 42: 44. 1979; Mold., Phytol. Mem. 2: 166 & 623. 1980.

SYNGONANTHUS GRACILIS var. *PULCHER* Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 73--74. 1977; Mold., Phytol. Mem. 2: 166 & 623. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 347. 1928 (Ld, N, W).

SYNGONANTHUS GRACILIS var. *RECURVIFOLIUS* Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Mold., Phytologia 42: 44 & 199. 1979; Mold., Phytol. Mem. 2: 120, 166, & 623. 1980; Hocking, Excerpt. Bot. A.36: 22. 1981.

Knuth (1927) cites only the type collection, *Passarge & Selwyn* 81, from Bolívar, Venezuela.

Recent collectors describe this plant as having basal rosettes and growing solitary or in clumps on wet savannas with thin soil over white sand, at 1200 m. altitude, in flower and fruit in August.

Additional citations: VENEZUELA: Bolívar: *Moore, Ambrose, Dietz, & Pfister* 9650 (Ba).

SYNGONANTHUS GRACILIS var. *SETACEUS* Ruhl.

Additional bibliography: Mold., Phytologia 37: 71 & 74--75. 1977; Mold., Phytol. Mem. 2: 112, 166, 425, & 623. 1980.

Recent collectors describe the inflorescences of this plant as white and found it growing at 400 m. altitude, in flower in August.

Additional citations: COLOMBIA: Guainía: *García-Barriga* 20817 (W--2844178).

SYNGONANTHUS GRACILIS var. *SUBINFLATUS* Ruhl.

Additional bibliography: Mold., Phytologia 37: 71, 73, & 75--76. 1977; Mold., Phytol. Mem. 2: 166, 424, 425, & 623. 1980.

SYNGONANTHUS GRACILIS var. *TENUISSIMUS* Ruhl.

Additional bibliography: Mold., Phytologia 42: 199. 1979; Mold., Phytol. Mem. 2: 120, 166, & 623. 1980; Hocking, Excerpt. Bot. A.36: 22. 1981; Mold., Phytologia 54: 235 & 237. 1983.

Recent collectors have describes this plant as a heliophile with gray inflorescence heads and have encountered it on white-sand airstrips, on slopes dominated by bracken fern and ericaceous shrubs, in podzolic soil in depressions with organic debris, in white sand of scrubby forests, and "in dense colonies near woods", at 100--1700 m. altitude, in both flower and fruit in February, October, and December, and only in fruit in May.

Additional citations: VENEZUELA: Amazonas: *O. Huber 1548* (Ld); *Liesner 3857* (Ld), *3870* (Ld), *3873* (Ld), *3911* (Ld), *3912* (Ld); *J. A. Steyermark 129425* (Ld). Anzoátegui: *Davidse & González 19917* (Ld). BRAZIL: Minas Gerais: *Regnell III.1801* (Ld--photo of co-type, W--936266--cotype). Rio de Janeiro: *Araujo & Maciel 4608* [Herb. FEEMA. 20568] (N), *5179* [Herb. FEEMA. 23019] (N), *5238* [Herb. FEEMA. 22960] (N).

SYNGONANTHUS GRAO-MOGOLENSIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 77--78. 1977; Mold., *Phytol. Mem.* 2: 166, 443, & 623. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 342--343, pl. 216. 1928 (Ld, N, W).

SYNGONANTHUS GRAO-MOGOLENSIS var. *DETONSUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 77--78. 1977; Mold., *Phytol. Mem.* 2: 166, 443, & 623. 1980.

Additional citations: BRAZIL: Minas Gerais: *Irwin, Santos, Souza, & Fonsêca 23354* (W--2709903--isotype).

SYNGONANTHUS GUIANENSIS Mold.

Additional bibliography: Mold., *Phytologia* 37: 78. 1977; Mold., *Phytol. Mem.* 2: 123 & 623. 1980.

Additional citations: GUYANA: *Maguire & Fanshawe 23236* (W--1907823--isotype).

SYNGONANTHUS HABROPHYUS Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 78--79, 423, & 489 (1977) and 38: 50. 1977; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

Recent collectors describe this plant as a heliophyte, with white flower-heads, and found it in fruit in April.

Additional citations: BRAZIL: Rio de Janeiro: *Araujo & Maciel 3026* [Herb. FEEMA. 14857] (Ld); *Glaziou 6449* (W--1124114--isotype).

SYNGONANTHUS HARLEYI Mold.

Additional bibliography: Mold., *Phytologia* 37: 79 (1977) and 42: 199. 1979; Mold., *Phytol. Mem.* 2: 166 & 623. 1980; Mold. in *Harley & Mayo, Toward Checklist Fl. Bahia* 77. 1980.

Mori and his associates found this plant growing in dry sand with full exposure to the sun, in fruit in May.

Additional citations: BRAZIL: Bahia: *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16662* (W--2771327--isotype); *Mori, Boom, & Carvalho 14096* (Ld, N). MOUNTED ILLUS-

TRATIONS: Mold., Phytologia 31: 488--490. 1975 (Ld).

SYNGONANTHUS HATSCHBACHII Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 87. 1979; Mold., Phytologia 42: 199. 1979; Mold., Phytol. Mem. 2: 166 & 623. 1980.

Additional citations: BRAZIL: Bahia: *Hatschbach* 39668 (W--2850769--isotype); Mori, Mattos Silva, & Santos 10471 (N).

SYNGONANTHUS HELMINTHORRHIZUS (Mart.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 79--82 & 89 (1977) and 38: 118 & 120. 1977; Mold., Phytol. Mem. 2: 166, 179, 428, 443, & 623. 1980; Mold., Phytologia 54: 144. 1983.

Recent collectors have found this plant growing in brejo.

Additional citations: BRAZIL: Distrito Federal: *Héringer*, *Filgueiras*, *Mendonça*, & *Pereira* 4916 (W--2926763); *Pereira* 224 (N, W--2941404). Goiás: *Macedo* 3341 (W--2197100). Mato Grosso: *Hatschbach* 32346 (W--2839286).

SYNGONANTHUS HELMINTHORRHIZUS var. *GLANDULOSUS* Mold.

Additional bibliography: Mold., Phytologia 37: 81 & 82. 1977; Mold., Phytol. Mem. 2: 166, 443, & 623. 1980; Mold., Phytologia 54: 144. 1983.

Héringer and his associates refer to this plant as having its leaves very numerous at the base of the plant and the inflorescence light-yellow. They found it in flower and fruit in April, distributing their material as *Paepalanthus* sp. In some herbaria it has been distributed as typical *S. helminthorrhizus* (Mart.) Ruhl.

Additional citations: BRAZIL: Distrito Federal: *Héringer*, *Figueiras*, *Mendonça*, *Pereira*, *Héringer Salles*, & *Chagas e Silva* 4313 (E--2904851, N, W--2931336); *France & Silva* 59041 (W--2514725).

SYNGONANTHUS xHESSII Mold.

Additional bibliography: Mold., Phytologia 37: 82--83. 1977; Mold., Phytol. Mem. 2: 234, 444, & 623. 1980.

Citations: MOUNTED ILLUSTRATIONS: Hess, Bericht. Schweitz. Bot. Gesell. 65: 198, fig. 5. 1955 (Ld--photo of cotype, N--photo of cotype).

SYNGONANTHUS HETEROPEPLOIDES Herzog

Additional bibliography: Mold., Phytologia 42: 200. 1979; Mold., Phytol. Mem. 2: 120, 166, & 623. 1980; Mold., Phytologia 54: 235. 1983.

Recent collectors describe this plant as sometimes submerged, sometimes "emersed from water", and sometimes terrestrial "en solo encharcado", 10--15 cm. tall, the leaves in rosettes, the inflorescence heads and flowers white. They have found it on campo with natural park vegetation, "locally frequent" or "common all over the savannas", at 100--900 m. altitude, in flower in April and in both flower and fruit in August and December.

The Tillett 45486 & 45744 collections, distributed as *S. heteropeplodes*, actually are *S. xeranthemoides* var. *grahamae* Mold., while Steyermark 57848 is *Paepalanthus saxicola* var. *conicus* Mold.

Additional citations: VENEZUELA: Amazonas: O. Huber 2431 (Ld), 2667 (Ld), 3973 (Ld); Maguire, Wurdack, & Maguire 41630 (W--2279293); Wurdack & Adderley 43707 (W--2320950). Bolívar: Steyermark & Liesner 127482 (Ld). BRAZIL: Amazonas: Janssen 276 (Ld).

SYNGONANTHUS HETEROPEPLUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 84--85. 1977; Mold., *Phytol. Mem.* 2: 126 & 623. 1980.

SYNGONANTHUS HETEROPHYLLUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 42: 200. 1979; Mold., *Phytol. Mem.* 2: 166 & 623. 1980; Mold., *Phytologia* 54: 237. 1983.

Recent collectors have found this plant growing in cerrado on campo rupestre, in both flower and fruit in May.

Additional citations: BRAZIL: Minas Gerais: Gibbs, Abbott, & Andrade 5006 (Ld); Hatschbach 41323 (N, W--2840048). Rio de Janeiro: Araujo & Henriques 4910 [Herb. FEEMA. 22138] (N). MOUNTED ILLUSTRATIONS: Alv. Silv., *Fl. Mont.* 1: pl. 234. 1928 (Ld--photo of type, N--photo of type).

SYNGONANTHUS HETEROTRICHUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 85--86 & 262. 1977; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: A. Silv., *Fl. Serr. Min.* 73. 1908 (W); A. Silv., *Fl. Mont.* 1: 311--313, pl. 197 (Ld, N) & 198. 1928 (Ld--photo of type, N--photo of type, W--photo of type); Mold., *Phytologia* 4: 320. 1953 (W).

SYNGONANTHUS HIRTELLUS Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 86. 1977; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

SYNGONANTHUS HONDURENSIS Mold.

Additional bibliography: Mold., *Phytologia* 42: 200. 1979; Mold., *Phytol. Mem.* 2: 74 & 623. 1980.

SYNGONANTHUS HUBERI Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 200. 1979; Mold., *Phytol. Mem.* 2: 112, 120, 123, 166, 172, & 623. 1980.

Recent collectors describe the flowers of this plant as "cream"-color and have found it growing on wet waterfall rocks, in water of small streams below morichal, and with *Utricularia* on sand near rivers, in both flower and fruit in August and December. It has been encountered at 950 m. altitude.

The Calderón, Monteiro, & Guedes 2609, Cuatrecasas 6982,

Schultes & Cabrera 13109, 13192, 14412, 17240, & 19702, and A. C. Smith 2112, distributed as S. huberi, actually are S. macrocaulon Ruhl.

Additional citations: COLOMBIA: Meta: Killip 34259 (W--1771076). VENEZUELA: Bolívar: Steyermark & Liesner 127427 (Ld). BRAZIL: Amazonas: Calderón, Monteiro, & Guedes 2957 (Ld, W--2931224); Kubitzki, Calderón, & Poppendieck 79-131 (W--2927022); Prance, Maas, Atchley, Steward, Woolcott, Coêlho, Monteiro, Pinheiro, & Ramos 14426 (N, W--2801668). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22433 (N, W--2935296); Cid, Ramos, & Mota 1257 [Herb. INPA. 94632] (Ld, N).

SYNGONANTHUS HUBERI f. *VIVIPARUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 200. 1979; Mold., *Phytol. Mem.* 2: 166 & 623. 1980.

SYNGONANTHUS HUMBERTI Mold.

Additional bibliography: Mold., *Phytologia* 37: 88. 1977; Mold., *Phytol. Mem.* 2: 251 & 623. 1980.

Additional citations: MOUNTED ILLUSTRATIONS: Mold. in Humbert, *Fl. Madag.* 36: fig. 18--24. 1955 (Ld).

SYNGONANTHUS HUMBOLDTII (Kunth) Ruhl.

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 182. 1927; Mold., *Phytologia* 42: 200--201. 1979; Mold., *Phytol. Mem.* 2: 112, 120, 125, 166, 443, 623, & 627. 1980; Hocking, *Excerpt. Bot.* A.35: 324. 1980; Mold., *Phytologia* 45: 40 (1980), 46: 155 (1980), 50: 245, 246, & 264 (1982), 51: 245 (1982), 52: 119 (1982), 54: 145 & 235 (1983), and 55: 84 & 102--104. 1984.

Recent collectors describe this plant as a small or even diminutive, ephemeral herb, 10--20 cm. tall, the inflorescence heads white or grayish-white, and the flowers themselves white or pale-gray. They refer to it as "rare" or "common" on the white sand of wet savannas or even to be dominant there, in wet places in general and at water-holes, on wet campos and open white-sand campinas, abundant on sandy disturbed savannas, frequent on sabana anegazida, on "sabana baja sobre suelo rosado-blancizo arenoso y 'cowfoothill'-sabana", and "in the lower part of quebradas among rocks with a narrow gallery forest with *Mauritia*", at 70--300 m. altitude, in flower in January, April, and September, and both in flower and fruit in February, August, and November.

Knuth (1927) cites *Chaffanjon 121 & 137 and Humboldt & Bonpland s.n.* from Bolívar, Venezuela.

Material of typical *S. humboldtii* has been misidentified, distributed in some herbaria, and even cited by me in previous installments of these notes as the very similar *S. fertilis* (Körn.) Ruhl., *S. fertilis* var. *glandulosus* (Gleason) Mold., and *S. humboldtii* var. *humilis* Mold.

On the other hand, the *Cuatrecasas 7693*, distributed and even

previously cited by me as typical *S. humboldtii*, actually is now the type collection of its var. *glabrescens* Mold., while Agostini 256 & 348, Davidse 2752, Lasser 1762, Malme 3342, Murça Pires 16068, Murça Pires & al. 6078 & 6188, Oldenburger & al. ON.558, Prance & al. P.25188 & P.25247, Vareschi & Foldats 4629, and Wurdack & Monachino 39948 are *S. fertilis* (Körn.) Ruhl., and Cárdenas & Pyykkö 1395 and Zarucchi 1998 are *S. fertilis* var. *fuscus* Mold.

Additional & emended citations: VENEZUELA: Amazonas: Foldats 3536 (N); Holt & Gehriger 234 [Herb. Leonard 7662] (B, Cm, N, Ve, W--1471944); O. Huber 571 (Ld), 971 (Ld), 1077 (Ld), 1195 (Ld), 1385 (Ld), 1549 (Ve), 1681 (Ld), 2180 (Ld), 2381 (Ld), 2720 (Ld), 4156 (Ld), 4172 (Ld), 4690 (Ve); Maas & Huber 5128 (Ba); Maguire, Cowan, & Wurdack 30985 (N, Ve). Apure: Davidse & González 15523 (Ld). Bolívar: J. A. Steyermark 75264 (Ld, N, W--2407749). BRAZIL: Mato Grosso: Kuhlmann 1630 (N); Malme 3342 (N, S, S). Pará: Daly, Callejas, Silva, Taylor, Rosario, & Santos 1079 (Ld); Murça Pires, Black, Wurdack, & Silva 6078 (N), 6188 (N). Roraima: Steward, Araujo, Buck, Ramos, & Ribamar 148 (N).

SYNGONANTHUS HUMOLDTII var. *ELONGATUS* Mold.

This taxon is now regarded as a synonym of typical *S. fertilis* (Körn.) Ruhl., which see.

SYNGONANTHUS HUMOLDTII var. *GLABRESCENS* Mold., Phytologia 46: 155. 1980.

Bibliography: Mold., Phytol. Mem. 2: 112 & 623. 1980; Mold., Phytologia 46: 155 (1980) and 52: 119. 1982.

This variety, based on Cuatrecasas 7693, with glabrous or glabrescent sheaths, was found growing in granitic soil on savannas, at 270 m. altitude, flowering in November. The flowers are described by the collector as white. It was previously erroneously regarded by me and cited by me as representing typical *S. humboldtii* (Kunth) Ruhl. Other collectors have found the plant growing in "marshy grassland around marsh among savanna-covered sand-dunes" and associated with *Panicum*, at 80--95 m. altitude, in both flower and fruit in March.

Citations: COLOMBIA: Meta: Davidse 16827a (Ld). Vaupés: Cuatrecasas 7693 (Ld--type, N--isotype, W--1796742--isotype). VENEZUELA: Apure: Davidse & González 15994 (Ld).

SYNGONANTHUS HUMOLDTII var. *GLANDULOSUS* Gleason

This taxon is now known as *S. fertilis* var. *glandulosus* (Gleason) Mold., which see.

SYNGONANTHUS HUMOLDTII var. *HUMILIS* Mold., Phytologia 45: 40. 1980.

Synonymy: *Syngonanthus humboldtii* var. *nanus* Mold., Phytol. Mem. 2: 627 nom. nud. 1980.

Bibliography: Hocking, Excerpt. Bot. A.35: 324. 1980; Mold.,

Phytol. Mem. 2: 623. 1980; Mold., Phytologia 45: 40 (1980) and 50: 246 & 264. 1982.

The *O. Huber* 971, distributed as this variety, actually seems to represent typical *S. humboldtii* (Kunth) Ruhl.

Citations: VENEZUELA: Amazonas: *O. Huber* 4235 (Ld). Apure: Davidse & González 15961 (Ld--type).

SYNGONANTHUS HUMBERTII var. *MACROCEPHALUS* Mold.

Additional bibliography: Mold., Phytologia 37: 92. 1977; Mold., Phytol. Mem. 2: 120 & 623. 1980.

SYNGONANTHUS HUMBERTII var. *ORINOCENSIS* Mold.

This taxon is now known as *S. fertilis* var. *orinocensis* (Mold.) Mold., which see.

SYNGONANTHUS HUMBERTII var. *SIMPLEX* Mold., Phytologia 51: 245. 1982.

Bibliography: Mold., Phytologia 51: 245. 1982.

Citations: BRAZIL: Pará: Martinelli 6895 [R. B. Herb. 203429] (N--type).

SYNGONANTHUS x *HYBRIDUS* Mold.

Additional bibliography: Mold., Phytologia 37: 93 & 267. 1977; Mold., Phytol. Mem. 2: 234, 444, & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS: H. Hess, Bericht. Schweitz. Bot. Gesell. 65: 198, fig. 6. 1955 (Ld--photo of type).

SYNGONANTHUS HYGROTICUS Ruhl.

Additional bibliography: Mold., Phytologia 37: 93--94. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

SYNGONANTHUS IMBRICATUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 94--95. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Additional citations: BRAZIL: Bahia: Carvalho, Lewis, & Hage 1027 (Ld).

SYNGONANTHUS INSULARIS Mold.

Additional bibliography: Mold., Phytologia 37: 85 & 252. 1977; Mold., Phytol. Mem. 2: 91, 92, & 624. 1980.

Additional citations: CUBA: Pinar del Río: León 15359 (N). ISLA DE PINOS: Bartsch s.n. [Apr. 11, 1937] (W--1559730); Britton, Britton, & Wilson 14162 (Ld--isotype, W--793033--isotype); Killip 42853 (W--2111875), 43684 (W--2175864), 44564 (W--2112726), 45613 (W--2226404); Leon & Seifríz 17521 (W--1784921).

SYNGONANTHUS INUNDATUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 95--96 (1977) and 38: 33. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

SYNGONANTHUS ITAMBEENSIS Alv. Silv.

Additional bibliography: Mold., Phytologia 42: 201. 1979;

Mold., Phytol. Mem. 2: 166, 444, & 624. 1980.

SYNGONANTHUS KUHLMANNII Mold.

Additional bibliography: Mold., Phytologia 37: 97 & 274. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

This species is very similar in general appearance to *S. densus* (Körn.) Ruhl.

Additional citations: BRAZIL: Amazonas: Prance, Pena, Forero, Ramos, & Monteiro 4790 (W--2576767). Pará: Cid, Ramos, & Mota 1504 (Ld, N).

SYNGONANTHUS KUHLMANNII f. *VIVIPARUS* Mold.

Additional bibliography: Mold., Phytologia 37: 97. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Additional citations: BRAZIL: Amazonas: Prance, Pena, Forero, Ramos, & Monteiro 4790a (W--2576766--isotype).

SYNGONANTHUS LAGOPODIODES (Griseb.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.31: 18. 1978; Mold., Phytologia 42: 201. 1979; Mold., Phytol. Mem. 2: 91, 92, & 624. 1980; Mold., Phytologia 53: 368 (1983) and 54: 232. 1983.

Material of this species has been misidentified and distributed in some herbaria as *Eriocaulon echinospermum* C. Wright. On the other hand, the Bartsch s.n. [Apr. 11, 1937], distributed as *S. lagopodioides*, actually is *S. insularis* Mold., as is also the León 15359 collection previously cited by me as *S. lagopodioides*. No less than 23 of the collections previously cited by me as this species are now regarded by me as representing the f. *minor* Mold., which see (below).

Additional citations: CUBA: Pinar del Río: Britton, Britton, & Gager 7058 (W--696884); Ekman 11035a (W--1302528), 11145 (W--1302532), 17254 (W--1302683); Killip 32327 (W--1712947); Shafer 10866 (W--793813); C. Wright 3237 in part (W--46431--isotype), s.n. (W--937168). ISLA DE PINOS: Britton, Britton, & Wilson 15789 (W--793387); Ekman 17254 (W--1302683); Killip 42672 (W--2111728), 43033 (W--2112026), 44064 (It, W--2176137), 44578 (W--2112736), 45171 (W--2226070), 45172 (W--2226071), 45562 (W--2226366), 45584 (W--2226381); Palmer & Riley 1056 (W--372566).

SYNGONANTHUS LAGOPODIODES f. *MINOR* Mold., Phytologia 53: 368. 1983.

Bibliography: Mold., Phytologia 53: 368 (1983) and 54: 232. 1983.

Collectors have encountered this plant in marshy soil at the edges of lakes, on white-sand savannas, in moist pinelands, and in moist sand along railroad tracks, in both flower and fruit from October to January.

Most of the collections cited below were previously listed by me under typical *S. lagopodioides* (Griseb.) Ruhl. before the present taxon was recognized. Collectors describe the plant as attaining a height of 2--4 inches.

Citations: CUBA: Pinar del Río: Carabia 739 (Cr, N), 741 (Cr,

N), 743 (Cr, N), 744 (Cr, N), 746 (Cr, N), 3021 (Cr, N); Ekman 10823 (N), 11061 (N); León 15359 (N), 17434 (N), 17438b (N); León & Alain 17795 (N); León, Moldenke, Acuna, & Alain 23402 (N, N), 23405 (N), 23406 (N), 23407 (N); Moldenke & Moldenke 19917 (Ld--type, N--isotype); Shafer 10995 (N). ISLA DE PINOS: Alain & Killip 2116 (W--2110106), 2162 (W--2110142); Britton, Britton, & Wilson 14217 (N), 14223 in part (N, W--793070); Carabia 997 (Cr, N), 1082 (Cr, N), 1189 (Cr, N), 3933 (Cr, N); Ekman 11973 (Ca--491268, N), 12071 (N, S, W--1302550); Killip 42600 (Le, W--2111673), 42672 (Le, S, W--2111728), 42830 (Le, W--2111858), 42856 (Gg--401112, Le, Mu, W--2111877), 42861 (Le, N, W--2111881), 44545 (Ld, N, W--2112709), 44565 (Ss, W--2112727), 44578 (Ss, W--2112736), 45172 (B, Mu, W--2226071), 45392a (Sm, W--2226229), 45508 (Sm, W--2226322), 45562 (Sm, W--2226366).

SYNGONANTHUS LANATUS Mold.

Additional bibliography: Galvão & Cavalcante, Bol. Mus. Para. Goeldi, ser. 2, Bot. Ind. 3 & 15. 1975; Mold., Phytologia 42: 201 (1979) and 46: 155. 1980; Mold., Phytol. Mem. 2: 120, 166, & 624. 1980.

Recent collectors have encountered this plant in "barrancos sombrio umidos as margens de rio". in both flower and fruit in October.

Additional citations: VENEZUELA: Bolívar: J. A. Steyermark 107221 (W--2925927). BRAZIL: Goiás: Hatschbach & Kasper 41698 (Ld).

SYNGONANTHUS LANATUS var. *ALPINUS* Mold.

Additional bibliography: Mold., Phytologia 37: 253. 1977; Mold., Phytol. Mem. 2: 120 & 624. 1980.

Recent collectors describe this plant as being definitely caulescent, the leaves erect, pale-green, in dense rosettes, pubescent, soft, the flower-heads white, and found it growing in dense tufts on rocky plateaus bordering *Bonnetia roraimae* groves and in *Stegolepis-Brocchinia-Heliamphora* bogs, at 1600--2420 m. altitude, flowering and fruiting in May, also in fruit in August. Steyermark and his associates note that the plant "also resembles *S. pakaraimensis* Mold."

Additional citations: VENEZUELA: Bolívar: Moore, Ambrose, Dietz, & Pfister 9792 (Ba); Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115700 (Ld), 115727 (Ld).

SYNGONANTHUS LANATUS var. *GLABRESCENS* Mold., Phytologia 46: 155. 1980.

Bibliography: Mold., Phytologia 46: 155. 1980; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Citations: BRAZIL: Mato Grosso: Murça Pires & Santos 16392 (N--type).

SYNGONANTHUS LANCEOLATUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 253. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 386--387, pl. 246. 1928 (Ld, N. W).

SYNGONANTHUS LARICIFOLIUS (G. Gardn.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 253--255 (1977) and 38: 25 & 38. 1977; C. D. Cook in Heywood, Flow. Pl. World 281, fig. 2. 1978; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Additional illustrations: C. D. Cook in Heywood, Flow. Pl. World 281, fig. 2. 1978.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: G. Gardn. in Hook., Icon. Pl. 6 [ser. 2, 2]: pl. 524. 1843 (W); Steud., Syn. Pl. Glum. 2: [Cyp.] 281. 1855 (W).

SYNGONANTHUS LARICIFOLIUS var. *LONGIFOLIUS* Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 255. 1977; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 340. 1928 (N, W).

SYNGONANTHUS LEONII Mold.

Synonymy: *Syngonanthus leoni* Mold. ex León & Alain, Fl. Cuba, imp. 1, 1: 284. 1946.

Additional bibliography: Mold., Phytologia 37: 255. 1977; Mold., Phytol. Mem. 2: 91 & 624. 1980; Mold., Phytologia 50: 264. 1982.

SYNGONANTHUS LEPRIEURI (Körn.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 5 & 165. 1979; Mold., Phytologia 42: 201. 1979; Mold., Phytol. Mem. 2: 120, 126, 166, 426, 444, & 624. 1980; Mold., Phytologia 54: 237. 1983.

Huber refers to this plant as a small herb common in white sand areas and "common all over the savannas", the flower-heads white. Janssen found it growing on temporarily flooded land with dense trees and shrubs, describing it as an herb "to 60 cm. tall", but the actual specimens accompanying this collection number (seen by me) are only to 22 cm. tall -- his statement on the label must surely be in error! The plant has been encountered at 100 m. altitude, both flowering and fruiting in August.

Additional citations: VENEZUELA: Amazonas: O. Huber 2531 (Ld), 2576 (Ld). Bolívar: J. A. Steyermark 111277 (W--2814185). FRENCH GUIANA: Cremers 5495 (Ld). BRAZIL: Amazonas: Janssen 578 (Ld).

SYNGONANTHUS LEPRIEURI f. *VIVIPARUS* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 5 & 165. 1979; Mold., Phytologia 42: 201. 1979; Mold., Phytol. Mem. 2: 166 & 624. 1980.

Additional citations: BRAZIL: Pará: Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Santos P.24837 (W--2868541--isotype).

SYNGONANTHUS LINEARIS Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 256. 1977; Mold., *Phytol. Mem.* 2: 166 & 624. 1980.

SYNGONANTHUS LLANORUM Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 201--202. 1979; Mold., *Phytol. Mem.* 2: 112, 120, & 624. 1980.

SYNGONANTHUS LONGIPES Gleason

Additional bibliography: Mold., *Phytologia* 42: 202. 1979; Mold., *Phytol. Mem.* 2: 112, 120, 123, 125, 166, & 624. 1980; Mold., *Phytologia* 54: 237. 1983.

Recent collectors describe this plant as an erect herb, about 30 cm. tall, the inflorescence heads white or "light". They have found it growing in brejo, on savannas, on wet banks and moist sand banks, near morichal on "sabanas de tatucos", and on "treeless wet savannas dominated by *Axonopus*, *Paspalum*, *Panicum*, and in spots *Rapateaceae*" -- ones notes "frequent on savannas, the immature flowers and buds maroon". They have found it as 100--1500 m. altitude, in both flower and fruit in February, March, May, and November, in flower also in August and December.

Additional citations: COLOMBIA: Guainía: *García-Barriga* 20836 (W--2844153). Vaupés: *Schultes*, *Baker*, & *Cabrera* 18448 (W--2198902); *Schultes* & *Cabrera* 14239 (W--2198868). VENEZUELA: Amazonas: *Brewer-Carías* s.n. [13 Dec. 1983] (Ld); *O. Huber* 2554 (Ld), 2686 (Ve), 3196 (Ve); *Huber* & *Medina* 5890 (Ld); *Huber* & *Tillett* 2895 (Ld); *Maguire*, *Cowan*, & *Wurdack* 30983 (W--2046519); *Thomas* & *Rogers* 2681 (N); *Wurdack* & *Adderley* 43714 (W--2320951). Bolívar: *Davidse*, *Ramía*, & *Montes* 4827 (E--2773080); *B. Maguire* 33230 (W--2168901); *J. A. Steyermark* 60304 (W--1987435), 75275 (W--2407751); *Steyermark*, *Berry*, *Dunsterville*, & *Dunsterville* 117229 (Ld); *Steyermark* & *Liesner* 127316 (Ld), 127480 (Ld); *Steyermark* & *Wurdack* 25 (W--2168500, W--2407788). GUYANA: Maas, *Mennega*, *Welle*, & *Groen* 5682 (Ld). BRAZIL: Distrito Federal: *Héringer*, *Filgueiras*, *Mendonça*, & *Pereira* 7394 (N, W--2941406); *Héringer*, *Mendonça*, *Pereira*, *Salles*, & *Silva* 4311 (N). Goiás: *Irwin*, *Maxwell*, & *Wasshausen* 19220 (W--2801665). Pará: *W. A. Anderson* 11013 (W--2755400). Rondônia: *Prance*, *Forero*, *Coelho*, *Ramos*, & *Farias* 5764 (W--2573055A); *Prance*, *Rodrigues*, *Ramos*, & *Farias* 8575 (W--2573057A).

SYNGONANTHUS LONGIPES var. *PILOSUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 202. 1979; Mold., *Phytol. Mem.* 2: 166 & 624. 1980.

SYNGONANTHUS JUNDELLIANUS Mold.

Additional bibliography: Mold., *Phytologia* 42: 202. 1979; Mold., *Phytol. Mem.* 2: 74 & 624. 1980.

SYNGONANTHUS MACROCAULON Ruhl.

Additional synonymy: *Syngonanthus macrocaulon* "Ruhl Doel Ruhl" ex Mold., *Phytol. Mem.* 2: 444 in syn. 1980.

Additional bibliography: Mold., *Phytologia* 42: 202. 1979; Mold., *Phytol. Mem.* 2: 112, 123, 125, 129, 166, 442, 444, & 624. 1980; Mold., *Phytologia* 54: 235 & 269 (1983) and 55: 81. 1984.

Recent collectors describe this plant's inflorescences as white or whitish and have found it growing in "catanga úmida cortada por diversos igarapés", on sandy banks, frequent on white-sand savannas and quartzite-based savannas, and as an aquatic under water in rapids and at the edges of waterfalls, at 150--250 m. altitude, in flower in May and December, and in both flower and fruit in June, July, and from September to November. Calderón and his associates refer to it as "very abundant delicate plants running over mosses on rocky river edges above waterfalls".

Material of *S. macrocaulon* has been misidentified and distributed in some herbaria, and even previously reported by me, as the very similar *S. anomalus* (Körn.) Ruhl. and *S. huberi* Ruhl., as well as *Tonina fluviatilis* Aubl. and *Tonina* sp. The Maguire & Politi 28309 collection, cited below, is a mixture with *Paepalanthus fasciculatus* (Rottb.) Kunth.

Additional & emended citations: COLOMBIA: Vaupés: Cuatrecasas 6982 (N, N, W--1796734); Schultes & Cabrera 13109 (Ss, W--2171099, W--2198878), 13192 (Ss, W--2198881), 14412 (Ss, W--2171416, W--2198872), 17240 (Ss, W--2198887), 19702 (N, W--2198922); Zarucchi 1934 (W--2832360). VENEZUELA: Amazonas: Maguire & Politi 28309 in part (W--2046458). GUYANA: A. C. Smith 2112 (W--1776633). FRENCH GUIANA: Oldeman B.2674 (Cy, Ld). BRAZIL: Amapá: Austin, Nauman, Rabelo, Rosário, & Santos 7306 (Ld, N, W--2932765); Egler & Murça Pires 47724 (W--2435310); Murça Pires & Cavalcante 52413 (W--2514895). Amazonas: Calderón, Monteiro, & Guedes 2609 (W--2931240). Pará: Murça Pires & Silva 4380 (Ld, N, W--2248395); Rosa & Santos 1880 (N, N).

SYNGONANTHUS MACROLEPIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 261. 1977; Mold., *Phytol. Mem.* 2: 166 & 624. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Serr. Min. 72. 1908 (W); Alv. Silv., Fl. Mont. 1: 309--311, pl. 196 & 196a. 1928 (Ld, N, W).

SYNGONANTHUS MARGINATUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 261--262. 1977; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43], 45--47, 53, & 58, fig. 83--89. 1979; Mold., *Phytol. Mem.* 2: 166 & 624. 1980.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 58, fig. 83--89. 1979.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 336--337, pl. 212. 1928 (Ld, N, W).

SYNGONANTHUS MENDESII Mold.

Additional bibliography: Mold., *Phytologia* 37: 262. 1977; Angely, S. Am. Bot. Bibl. 2: 671. 1980; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

SYNGONANTHUS MICROCEPHALUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 262. 1977;
Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 378--379, pl. 240. 1928 (Ld, N, W).

SYNGONANTHUS MICROPUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 262--263. 1977;
Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPING: Alv. Silv., *Fl. Mont.* 1: 314--315, pl. 199. 1928 (Ld, N, W).

SYNGONANTHUS MINUTIFOLIUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 263. 1977; Mold.,
Phytol. Mem. 2: 167 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 351--352, pl. 218. 1928 (Ld, N, W).

SYNGONANTHUS MINUTULUS (Steud.) Mold.

Additional bibliography: Mold., *Phytologia* 42: 44 & 202. 1979;
Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Bong.,
Ess. Monog. Erioc. 34. 1831 (N, W).

SYNGONANTHUS MULTICAULIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 264--265 (1977)
and 38: 28. 1977; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 380--382, pl. 242. 1928 (Ld, N, W).

SYNGONANTHUS MULTICAULIS var. *GLAUCUS* Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 265. 1977;
Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

SYNGONANTHUS MULTIPES Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 265. 1977; Mold.,
Phytol. Mem. 2: 167 & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 824--826, pl. 206. 1928 (Ld, N, W).

SYNGONANTHUS NANUS Mold.

Additional bibliography: Mold., *Phytologia* 37: 266. 1977; Mold.,
Phytol. Mem. 2: 167 & 624. 1980.

SYNGONANTHUS NGOWEENSIS H. Lecomte

Additional bibliography: Mold., *Phytologia* 42: 202. 1979; Mold.,
Phytol. Mem. 2: 207, 217, 221, 223, 234, 238, & 624. 1980.

SYNGONANTHUS NIGER Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 267. 1977;
Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 331--333.

1928 (Ld, N, W).

SYNGONANTHUS NIGRO-ALBUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 267. 1977; Mold., Phytol. Mem. 2: 167, 444, & 624. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 350--351, pl. 222. 1928 (Ld, N, W).

SYNGONANTHUS NITENS (Bong.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.31: 18. 1978; Mold., Phytologia 42: 203. 1979; Mold., Phytol. Mem. 2: 112, 120, 135, 167, 179, 426, 428, 441, 444, & 624. 1980; Mold., Phytologia 50: 246 (1982) and 54: 235, 237, & 244. 1983; Ramaswamy, Arekal, & Raju, Bull. Torrey Bot. Club 110: 291. 1983; Mold., Phytologia 55: 108. 1984.

Recent collectors describe this plant as having shiny leaves and flowering inflorescences as white or whitish, sometimes straw-color. They have found it growing in wet places, on wet to marshy savannas leading to gallery forests, "frequent" on white-sand savannas, on campo rupestre, in open wet sedge savannas, and "locally frequent" in morichal, often growing in dense clumps, at 75--2470 m. altitude, in both flower and fruit in February, July, and December. Steyermark and his associates labeled their no. 126082 collection as "n. sp.!"

Material of *S. nitens* has been misidentified and distributed in some herbaria as *S. flavipes* Mold. On the other hand, the *Hatschbach* 43211, distributed as typical *S. nitens*, actually is the var. *hirtulus* Ruhl. and Steyermark & al. 126082 is the type collection of *Leiothrix marahuacensis* Mold.

Additional & emended citations: VENEZUELA: Amazonas: O. Huber 3256 (Ld), 3357 (Lc); Steyermark, Guariglia, Holmgren, Luteyn, & Mori 126082 (Ld). Apure: Davidse & González 14276 (Ld, N), 15867 (Ld). Bolívar: Steyermark & Liesner 127527 (Ld); Wurdack & Monachino 39934 (N, S, W--2223427). BRAZIL: Bahia: Mori, King, Santos, & Hage 12409 (Ld, N--2854251), 12602 (Ld, W--2854282). Mato Grosso: Hatschbach 24615 (W--2705717). Paraná: Hatschbach 19963 (W--2705773). MOUNTED CLIPPINGS: Kunth, Enum. Pl. 3: 577. 1841 (W).

SYNGONANTHUS NITENS var. *ERECTUS* Ruhl.

Additional bibliography: Mold., Phytologia 37: 269, 271, & 273. 1977; Mold., Phytol. Mem. 2: 167 & 624. 1980.

SYNGONANTHUS NITENS var. *FILIFORMIS* (Bong.) Ruhl.

Additional bibliography: Mold., Phytologia 37: 269--274 & 420. 1977; Mold., Phytol. Mem. 2: 167, 179, & 624. 1980.

Additional citations: BRAZIL: Goiás: Macedo 3353 (W--2197105). Paraná: Reitz & Klein 17497 (W--2548330). PARAGUAY: Schinini 22945 (Ld).

SYNGONANTHUS NITENS var. *HIRTULUS* Ruhl.

Additional synonymy: *Syngonanthus nitens* var. *hirtelus* Ruhl.

ex Mold., *Phytologia* 54: 244 in syn. 1983.

Additional bibliography: Mold., *Phytologia* 42: 203. 1979; Mold., *Phytol. Mem.* 2: 167, 179, 428, & 624. 1980; Mold., *Phytologia* 54: 244. 1983.

Recent collectors have encountered this plant in brejo, wet brejo, and the brejo zone of campo, in flower in September and both in flower and fruit in August and October, describing the flowers as whitish.

Material of this variety has been distributed in some herbaria as typical *S. nitens* (Bong.) Ruhl.

Additional citations: BRAZIL: Distrito Federal: *Héringer* 17389 (N); *Héringer*, *Filgueiras*, *Mendonça*, & *Pereira* 7496 (N, W--2971678). Minas Gerais: *Hatschbach* 30186 (W--2706045). Pará: *Prance*, *Silva*, *Berg*, *Henderson*, *Nelson*, *Balick*, *Bahia*, & *Santos* P.25246 (W--2868548). Paraná: *Gottsberger* & *Poelt* s.n. [21.7. 1979] (Gr--196-80, Gr); *Hatschbach* 14768 (Eu--5822), 43211 (Ld), 45453 (Ld).

SYNGONANTHUS NITENS var. *KOERNICKEI* Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytologia* 42: 203. 1979; Mold., *Phytol. Mem.* 2: 112, 167, 179, & 624. 1980.

Recent collectors have encountered this plant in sandy soil of dunes, in both flower and fruit in May.

Material of this variety has been misidentified and distributed in some herbaria as *S. gracilis* (Bong.) Ruhl.

Additional citations: BRAZIL: Bahia: *Carvalho*, *Mori*, & *Boom* 714 (Ld). Distrito Federal: *Héringer*, *Filgueiras*, *Mendonça*, & *Pereira* 7328 (N, W--2941407). PARAGUAY: *Casas* & *Molero* FC.3822 (N).

SYNGONANTHUS NITENS f. *MALMII* Mold.

Additional bibliography: Mold., *Phytologia* 37: 421. 1977; Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

SYNGONANTHUS NITENS f. *PILOSUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 421. 1977; Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytol. Mem.* 2: 167 & 624. 1980; Mold., *Phytologia* 54: 237. 1983.

Recent collectors describe this plant as a frequent herb, with large, dense, basal rosettes of leaves and deep, thick roots, the inflorescence heads white, and have encountered it in brejo, in sandy soil of campo rupestre, at the edges of open, rocky streams, and in white-sand soil in depressions in savannas, at 1100 m. altitude, in both flower and fruit in July, August, and October.

Additional citations: BRAZIL: Amazonas: *Calderón*, *Monteiro*, & *Guedes* 2734 (Ld), 2735 (W--2931229). Goiás: *Hatschbach* 43075 (Ld, W--2931982). Mato Grosso: *Maguire*, *Murça Pires*, *Maguire*, & *Silva* 56230 (W--2514896). Paraná: *Hatschbach* 14768 (Ld). BOLIVIA: Santa Cruz: *Daly*, *Hopkins*, *Forero*, *Beck*, *Her-*

nández, Phipps, & Wolf in Daly 2187 (Ld).

SYNGONANTHUS NITENS var. *VIVIPARUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 421--422. 1977; Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytol. Mem.* 2: 167, 441, & 624. 1980.

SYNGONANTHUS NITIDUS (Bong.) Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytologia* 42: 203. 1979; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Additional citations: BRAZIL: Minas Gerais: *Héringer & Rizzini 17612* (Fe, Ld). MOUNTED CLIPPINGS: Kunth, *Enum. Pl.* 3: 579. 1841 (N, W).

SYNGONANTHUS NIVEO-AUREUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 37: 485 (1977) and 38: 126. 1977; Hocking, *Excerpt. Bot. A.31*: 18. 1978; Mold., *Phytol. Mem.* 2: 167, 361, & 624. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 375--376. 1928 (N, W).

SYNGONANTHUS NIVEUS (Bong.) Ruhl.

Additional & emended bibliography: Bong., *Mem. Acad. Imp. Sci. St.-Petersb.*, ser. 6, 1: 635--636. 1831; Mold., *Phytologia* 37: 485--489 (1977) and 42: 203--204. 1979; Mold., *Phytol. Mem.* 2: 167, 361, 401, & 624. 1980.

In the commercial trade the inflorescences of this plant are known as "diamantinas", "everlasting", "floral-button", "fuzzy-flowers", "glífcia", "glíxia", "hill-flower", "perpetua-flowers", "sempervivum", "sempre-vivas", "sky-rocket", and "starflower".

Additional citations: CULTIVATED (imported): New Jersey: *L. Parker s.n.* [June 6, 1973] (Ba--380879). MOUNTED CLIPPINGS: Kunth, *Enum. Pl.* 3: 579. 1841 (N, W).

SYNGONANTHUS NIVEUS var. *ROSULATUS* (Körn.) Mold.

Additional bibliography: Mold., *Phytologia* 42: 203. 1979; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

SYNGONANTHUS NIVEUS var. *STRIGOSUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 203--204. 1979; Mold., *Phytol. Mem.* 2: 167 & 624. 1980.

Additional citations: BRAZIL: Bahia: *Mori, Mattos Silva, Kallunki, Santos, & Pereira dos Santos 9701* (N); *Ribeiro, Mattos Silva, & Hage 24* (Ld).

SYNGONANTHUS OBLONGUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 204. 1979; Mold., *Phytol. Mem.* 2: 112, 120, 167, 444, & 624. 1980; Mold., *Phytologia* 50: 246. 1982.

The type collection has very much elongated stems and very few (3) peduncles, but the Froes collection, while having the elon-

gated stems, has many peduncles in the umbel.

The Anderson collection, cited below, was previously regarded by me as var. *aequinoctialis* Ruhl., but seems to me now to represent, rather, the typical form of this variable species.

Recent collectors have encountered the plant growing "in sand over rocks by waterfalls", flowering in August.

The following collections, previously cited at the typical form of this species, are now regarded as representing the var. *aequinoctialis* Ruhl.: Berg, Bisby, Steward, & Ramos P.18192, Cuatrecasas 7158, Maguire & Maguire 29158, Schultes & Cabrera 17519, 19677, 19692, & 19753, Steyermark 90341, and Steyermark & al. 124062.

Additional & emended citations: VENEZUELA: Amazonas: Maguire, Cowan, & Wurdack 29630 (W--2046479). BRAZIL: Amazônia: Calderón, Monteiro, & Guedes 2959 (Ld, W--2931223). Maranhão: Prance 2100 (W--2573058A). Pará: W. R. Anderson 10644 (Ld, N, W--2755402); Froes 29940 (W--2343720). Piauí: G. Gardner 2962 (W--936280--isotype, W--1066758--isotype).

SYNGONANTHUS OBLONGUS var. *AEQUINOCTIALIS* Ruhl.

Additional bibliography: Mold., Phytologia 42: 204. 1979; Mold., Phytol. Mem. 2: 112, 167, 444, & 624. 1980; Mold., Phytologia 50: 246. 1982.

Recent collectors have encountered this plant in rills and on savannas over a quartzite base, at 265--1200 m. altitude, in flower in January and November. Most of the cited collections exhibit the characteristic short stems of the variety. The W. R. Anderson 10644, previously cited as this variety, seems now to me to represent the typical form of the species.

Additional & emended citations: COLOMBIA: Vaupés: Cuatrecasas 7158 (N, N, W--1796736); Schultes & Cabrera 17519 (Ss, W--2198888), 19677 (Ss, W--2198920), 19692 (Ss, W--2198921), 19753 (Ss, W--2198925). VENEZUELA: Amazonas: Maguire & Maguire 29158 (N, Ve, W--2046471). Bolívar: J. A. Steyermark 90341 (Ca, W--2430206); Steyermark, Maguire, Brewer-Carias, Maguire, & Espinosa 124062 (N). BRAZIL: Amazônia: Berg, Bisby, Steward, & Famos P.18192 (Ld, N, W--2772581); Nelson & Lima P.21062 (N, W--2935358). MOUNTED CLIPPINGS: Herzog, Feddes Repert. Spec. Nov. 29: 212. 1931 (N, W).

SYNGONANTHUS OBTUSIFOLIUS Mold.

Additional bibliography: Mold., Phytologia 37: 492. 1977; Mold., Phytol. Mem. 2: 120 & 624. 1980.

Recent collectors describe this plant as having pale-green leaves, all in one plane, in habit resembling *Stegolepis*, and the inflorescence heads gray or "gris dorados", sometimes whitish. They have encountered it on rocky or swampy savannas and among sandstone rocks. Huber and his associates refer to it as frequent or very frequent in open rocky areas and also on open savannas and frequent "en pradera", at 1850--2200 m. altitude. They have found it in both flower and fruit in January and February.

Additional citations: VENEZUELA: Bolívar: Huber & Steyermark

6864 (Ld), 7061 (Ld), 7082 (Ld); Steyermark, Huber, & Carreño E. 128090 (Ld), 128453 (Ld), 128519 (Ld), 128793 (Ld); Steyermark & Wurdack 406 (W--2168590--isotype, W--2407790--isotype).

SYNGONANTHUS ONEILLII Mold.

Additional bibliography: Mold., Phytologia 42: 204. 1979; Mold., Phytol. Mem. 2: 74 & 624. 1980.

Additional citations: BELIZE: O'Neill 8548 (Ld--photo of isotype, W--1790080--isotype), 8549 (W--1790081).

SYNGONANTHUS PAEPALOPHYLLUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 493. 1977; Mold., Phytol. Mem. 2: 167 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 377--378, pl. 240. 1928 (Ld, N, W).

SYNGONANTHUS PAKARAIMENSIS Mold.

Additional bibliography: Mold., Phytologia 37: 493. 1977; Mold., Phytol. Mem. 2: 120, 123, & 625. 1980; Mold., Phytologia 55: 98. 1984.

Recent collectors describe this plant as being non-caulescent, the leaves spreading, rich-green, borne in dense rosettes, and have found it growing on rocky plateaus, at 2360--2420 m. altitude, in fruit in February. Steyermark notes that it "also resembles *S. lanatus* var. *alpinus* Mold." The *B. Maguire* 33231, previously reported as *S. pakaraimensis*, actually is *S. densus* (Körn.) Ruhl., a very similar species.

Additional citations: VENEZUELA: Bolívar: *B. Maguire* 33748 (W--2168917); J. A. Steyermark 93761 (W--2584302); Steyermark, Espinosa, McDiarmid, & Brewer-Carías 115726 (Ld). GUYANA: *Maguire & Fanshawe* 32539 (W--2168885--isotype).

SYNGONANTHUS PALLENS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 493--494. 1977; Mold., Phytol. Mem. 2: 167 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 349--350, pl. 221. 1928 (Ld, N, W).

SYNGONANTHUS PARAËNSIS Ruhl.

Additional bibliography: Mold., Phytologia 37: 494--495. 1977; Mold., Phytol. Mem. 2: 167 & 625. 1980.

Additional citations: BRAZIL: Amapá: *Egler & Irwin* 46578 (W--2435309). Amazonas: *Baldwin* 3231 (W--1878804).

SYNGONANTHUS PAUCIFLORUS Alv. Silv.

Additional bibliography: Mold., Phytologia 37: 495. 1977; Mold., Phytol. Mem. 2: 167 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 356--357, pl. 226. 1928 (Ld, N, W).

SYNGONANTHUS PAUPER Ruhl.

Additional bibliography: Mold., *Phytologia* 37: 495--496. 1977; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

SYNGONANTHUS PERUVIANUS Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 204. 1979; Mold., *Phytol. Mem.* 2: 135 & 625. 1980.

Additional citations: PERU: Amazonas: *Hutchison & Wright* 5556 (W--2508671). MOUNTED CLIPPINGS: J. F. Macbr., *Field Mus. Publ. Bot.* 11: 8. 1931 (W).

SYNGONANTHUS PHELPSAE Mold.

Additional bibliography: Mold., *Phytologia* 42: 204. 1979; Mold., *Phytol. Mem.* 2: 120, 167, 444, & 625. 1980.

Recent collectors describe this plant as growing in grass-green tufts on rocky wet savannas dominated by *Stegolepis* and *Cottendorfia*, with *Nietneria*, *Tofieldia*, *Xyris*, *Abolboda*, and *Lagenocarpus* also present and in large tufts on open wet savannas, at 1300--1540 m. altitude, in flower and fruit in May, and also in fruit in April. Steyermark and his associates refer to it as common on wet swampy savannas, the leaves rich-green and the flower-heads "pale-white".

Additional citations: VENEZUELA: Amazonas: *Maguire & Politi* 27697 (W--20464420). Bolívar: *B. Maguire* 32801 (W--2168892); *J. A. Steyermark* 93504 (Ld, W--2584106), 93696 (W--2584108); *Steyermark, Berry, Dunsterville, & Dunsterville* 117342 (Ld), 117500 (Ac); *Steyermark, Dunsterville, & Dunsterville* 117966 (Ld).

SYNGONANTHUS PHELPSAE var. *CARDONAE* Mold.

Additional bibliography: Mold., *Phytologia* 37: 498 (1977) and 42: 204. 1979; Mold., *Phytol. Mem.* 2: 120, 444, & 625. 1980.

Phelps and Hitchcock refer to this as a "typical little humus plant growing all over the cumbre", in fruit in February.

Additional citations: VENEZUELA: Amazonas: *Cowan & Wurdack* 31098 (W--2046523--isotype); *Phelps & Hitchcock* 524 (N).

SYNGONANTHUS PHELPSAE var. *PILOSUS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 499. 1977; Mold., *Phytol. Mem.* 2: 120 & 625. 1980.

Additional citations: VENEZUELA: Amazonas: *Maguire, Wurdack, & Bunting* 37308 (W--2168999--isotype); *Maguire, Wurdack, & Maguire* 42261 (W).

SYNGONANTHUS PHELPSAE var. *VIRIDIS* Mold.

Additional bibliography: Mold., *Phytologia* 37: 499. 1977; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

SYNGONANTHUS PHILCOXII Mold.

Additional bibliography: Mold., *Phytologia* 37: 499. 1977;
Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

SYNGONANTHUS PHILODICOIDES (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 23. 1977;
Hocking, *Excerpt. Bot. A.* 31: 18. 1978; Mold., *Phytologia* 45: 209.
1980; Mold., *Phytol. Mem.* 2: 123, 167, & 625. 1980; Silva & Mori,
Cent. Pesq. Cacau Bol. Técn. 89: 8 & 53. 1981.

Huber & Tillett refer to this plant as an "hierba diminuta
poco frecuente en sabana anegadiza, en canalículos, cabezuelas
blanquecino-plateadas", and found it in both flower and fruit in
July, at 100 m. altitude.

Additional citations: VENEZUELA: Amazonas: Huber & Tillett
5283 (Ld).

SYNGONANTHUS PHILODICOIDES var. *MORII* Mold., *Phytologia* 45: 209.
1980.

Bibliography: Mold., *Phytologia* 45: 209. 1980; Mold., *Phytol.*
Mem. 2: 167 & 625. 1980; Silva & Mori, *Cent. Pesq. Cacau Bol.*
Técn. 89: 53. 1981.

Citations: BRAZIL: Bahia: Mori, King, Santos, & Hage 12641
(Ld--isotype, W--2854278--isotype).

SYNGONANTHUS PITTIERI Mold.

Additional bibliography: Mold., *Phytologia* 38: 23. 1977; Mold.,
Phytol. Mem. 2: 84 & 625. 1980.

Additional citations: MOUNTED CLIPPINGS: Mold. in Woodson &
Schery, *Ann. Mo. Bot. Gard.* 27: 269. 1940 (W).

SYNGONANTHUS PLANUS Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 23--24. 1977;
Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 167 &
625. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77.
1980.

Additional citations: BRAZIL: Bahia: Harley, Renvoize, Erskine,
Brighton, & Pinheiro in Harley 15272 (W--2771328).

SYNGONANTHUS PLUMOSUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 24--25. 1977;
Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 167,
444, & 625. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv.
Silv., *Fl. Mont.* 1: 339--340, pl. 214. 1928 (Ld, N, W).

SYNGONANTHUS POGGEANUS Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 25--26. 1977;
Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 221,
223, 234, 236, 444, & 625. 1980.

[to be continued]

MISCELLANEOUS NEW SPECIES
IN THE PLEUROTHALLIDINAE (ORCHIDACEAE)

Carlyle A. Luer

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Brachionidium diaphanum Luer & Vásquez, sp. nov.

Planta parva repens, rhizomate elongato ramificanti, foliis ellipticis cauli longioribus, pedunculo gracili folio brevior, flore grandi, sepalis petalisque diaphanis, sepalo mediano suborbiculato longicaudato, synsepalo ovato longicaudato apice fisso, petalis obovatis obliquis minute ciliatis longicaudatis, labello transverse oblongo, angulis basalibus acutis incurvis, disc cum callo ovoideo pubescenti.

Plant small, epiphytic in moss, the rhizome elongate, repent, branching, 3-12 mm long between secondary stems, enclosed by frequently shed, tubular sheaths; roots slender, from nodes. Secondary stems ascending, 4-5 mm long, enclosed by 2 tubular sheaths. Leaf erect, coriaceous, elliptical, acute, 15-22 mm long, 4-6 mm wide, narrowly cuneate below into a subpetiolate base. Inflorescence a solitary, non-resupinate flower borne by a slender peduncle 6-7 mm long, with a bract below the middle; floral bract infundibular, 4 mm long; pedicel 1 mm long, with a filament 4 mm long; ovary stout, 2.5 mm long; sepals and petals translucent white, the middle sepal suborbiculato-obovate, 9 mm long, 8.5 mm wide, 3-veined, the apex obtuse, acuminate into a filiform tail ca. 20 mm long, the lateral sepals connate into an ovate synsepal 12 mm long, 9 mm wide, 4-veined, the apex acute, acuminate into a tail ca. 20 mm long, split apically for ca. 10 mm; petals broadly obovate, oblique, 8.5 mm long, 7 mm wide, the apex obliquely acute, acuminate into a filiform tail ca. 18 mm long; lip yellow-white, transversely oblong, concave, 3 mm long, 7 mm wide expanded, the rounded apex bluntly apiculate, the basal angles acute, incurved, the broad base delicately hinged to the column-foot, the disc with an ovoid, pubescent callus, shallowly channeled; column stout, rose, 2 mm long; pollinia 8.

Etymology: From the Latin diaphanus, "colorless and nearly transparent," referring to qualities of the flower.

Type: Bolivia: Dept. of Cochabamba: Prov. of Chapare: epiphytic in moss in cloud forest near Pampa Tambo, alt. 2700 m, 28 Oct. 1979, R. Vásquez 197 (Holotype: SEL; Isotype: Herb. Vásquezianum), C. Luer illustr. 9407; same area, alt. 2500 m, 22 Jan. 1980, in fruit, C. Luer, J. Luer & R. Vásquez 4973 (SEL).

This small, repent species is most noteworthy for the comparatively large, diaphanous flowers. The sepals and petals are provided with long, filiform tails, that of the synsepal being split for about half the length.

Brachionidium muscosum Luer & Vasquez, sp. nov.

Planta pusilla repens, rhizomate elongato ramificanti, foliis ellipticis caulibus longioribus, pedunculo filiformi folio longiore, sepalis petalisque diaphanis similibus ovatis minute ciliatis longi-attenuatis, labello minuto triangulari cum callo ovoideo pubescenti.

Plant very small, epiphytic in moss, the rhizome elongated, repent, branching, 2-5 mm long between secondary stems, enclosed by 2-4 tubular sheaths with attenuate apices; roots slender, from nodes. Secondary stems ascending, 1.5-2 mm long, enclosed by 2 tubular sheaths with attenuate apices. Leaf suberect, coriaceous, elliptical, acute, apiculate, 8-10 mm long, 3-4.5 mm wide, 3-veined, cuneate below into a 1 mm long petiole. Inflorescence a single, non-resupinate, delicate flower borne by an erect, filiform peduncle 12-14 mm long, with a bract below the middle; floral bract infundibular, acute, 1.5 mm long; pedicel 0.5 mm long, with a filament 2 mm long; ovary 1 mm long; sepals and petals translucent white, the middle sepal ovate in the lower fourth, minutely ciliate, the apex acute, long-attenuate into a filiform tail, 10 mm long, 1.75 mm wide, 3-veined; lateral sepals completely connate into a synsepal similar to the middle sepal, 10.5 mm long, 1.8 mm wide, 4-veined; petals ovate in the lower quarter, minutely fimbriate, the apex acute, attenuate into a filiform tail, 7 mm long, 1.25 mm wide, 1-veined; lip white, transversely ovate-triangular, concave, 1.25 mm long, 1.75 mm wide, the subacute apex minutely apiculate, the basal angles erect, narrowly rounded, the disc with an ovoid, pubescent callus, the broad base delicately hinged to the column-foot; column stout, 0.75 mm long; pollinia 6.

Etymology: From the Latin muscosus, "mossy," in reference to the habitat and appearance of the plant.

Type: Bolivia: Dept. of Cochabamba: Prov. of Chapare: epiphytic in moss in cloud forest east of Cochabamba toward Villa Tunari, alt. 1850 m, 29 Jan. 1984, C. Luer, J. Luer & R. Vasquez 9452 (Holotype: SEL).

This tiny species, discovered by Jane Luer, grows intertwined in loose mats of moss around the shaded bases of trees in moist cloud forest. The fragil little flowers are colorless and nearly transparent.

Brachionidium pteroglossum Luer, sp. nov.

Planta parva erecta rhizomate elongato, folio elliptico caule longiore, flore diaphano virescenti purpureo nervato, sepalis petalisque ovatis acutis caudatis, petalis ciliatis, labello transverse obtriangulari lobis lateralibus acutis expansis.

Plant small, epiphytic in moss, the rhizome erect, stout, 2 mm thick, 8-10 mm long between secondary stems, enclosed by 3 tubular, abruptly acuminate sheaths; roots slender, from nodes. Secondary stems suberect, slender, 5-7 mm long, enclosed by 2 abruptly acuminate sheaths. Leaf suberect, coriaceous, elliptical, acute, 15 mm

long, 5 mm wide, cuneate below into an indistinctly petiolate base. Inflorescence a non-resupinate, solitary flower borne by a slender, erect peduncle 12 mm long, with an apiculate bract near the middle; floral bract inflated, 3 mm long, acuminate; pedicel 1 mm long, with a filament 3 mm long; ovary 2 mm long; sepals and petals lime green with purple veins, the sepals sparsely ciliate, the middle sepal ovate, acuminate, acute, 12 mm long, 4.25 mm wide, 3-veined, the laterals connate into an ovate, acute lamina 12 mm long, 4.75 mm wide, 4-veined; petals ovate, oblique, acuminate, acute, ciliate, 11.5 mm long, 3 mm wide, 3-veined; lip green, transversely obtriangular, 2 mm long, 4 mm wide, the apex broadly rounded, thickened, shortly apiculate, the lateral angles acute, expanded, the disc with a rounded, microscopically pubescent callus; column stout, 2 mm long; pollinia 8.

Etymology: From the Greek pteroglossa, "a winged tongue," referring to the shape of the lip.

Type; Ecuador: Zamora-Chinchi: epiphytic on moss in dark, wet, cloud forest south of Yangana, alt. 2400 m, 30 Jan. 1980, D. D'Alessandro 80-001 (Holotype: SEL), C. Luer illustr. 9489.

This small species with a stout rhizome is notable for the translucent green, purple-veined flowers with long-acuminate sepals and petals, and a lip with acute, lateral lobes expanded forward.

Brachionidium vasquezii Luer, sp. nov.

Planta mediocris erecta, rhizomate elongato ramificanti, foliis ellipticis cauli longioribus, pedunculo erecto longissimo, flore grandi, sepalo mediano synsepaloque similibus late ovatis obtuse acuminatis brevicaudatis, petalis late ovatis obtuse acuminatis minute ciliatis, labello transverse ovato-oblongo apiculato, disco cum callo ovoideo.

Plant medium in size, terrestrial in moss, the rhizome erect, elongate, branching, 5-20 mm long between secondary stems, enclosed by 2-3 tubular sheaths, frequently shed; roots coarse, descending from nodes. Secondary stems ascending, 10-17 mm long, enclosed by 2 tubular sheaths. Leaf coriaceous, elliptical, acute, 15-25 mm long including the 1-3 mm long petiole, 5-8 mm wide, cuneate below into the petiole. Inflorescence a solitary, non-resupinate flower borne by an erect, slender peduncle 5-10 cm long, with a bract below the middle; floral bract infundibular, 5 mm long; pedicel 1 mm long, with a filament 5 mm long; ovary stout, 2.5 mm long; sepals and petals translucent rose, veined in purple, the middle sepal broadly ovate, the apex obtusely acuminate into a short tail ca. 2 mm long, 3-veined, 15 mm long, 9 mm wide, the lateral sepals totally connate into a synsepal similar to the dorsal sepal, 4-veined, 13 mm long, 9 mm wide; petals broadly ovate, the margins minutely ciliate, the apex obtusely acuminate into a short tail ca. 3 mm long, 13 mm long, 7 mm wide; lip purple, transversely ovate-oblong, concave, 2.5 mm long, 5 mm wide, 6 mm wide expanded,

the rounded apex shortly apiculate, the basal angles obtuse, erect, the broad base delicately hinged to the column-foot, the disc with an ovoid, rounded callus, shallowly concave anteriorly; column stout, 1.5 mm long, pollinia 8.

Etymology: Named in honor of Sr. Roberto Vásquez Ch., illustrious investigator of the Orchidaceae of Bolivia, illustrator and co-author of the Orchids of Bolivia, who discovered this species.

Type: Bolivia: Dept. of Cochabamba: Prov. of Chapare: Balconcillo, terrestrial in moss along the trail embankment, alt. 3250 m, 7 Dec. 1980, R. Vásquez 477 (Holotype: SEL; Isotype: Herb. Vásquezianum); same area, 16 Jan. 1981, C. Luer, J. Luer & R. Vásquez 5627 (SEL); same area, 17 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9356 (SEL).

Plants of this little species grow erect in fully exposed, deep, loose moss at the base of a dripping wet embankment at a high altitude where frosts are frequent during July and August. The erect, long, slender peduncle rises far above the highest leaf to bear the proportionately large, purple-striped flowers.

Lepanthes bifaria Luer, sp. nov.

Planta parva vel mediocris, inflorescentia foliis ellipticis longi-acuminatis brevior, racemo disticho densifloro, sepalis denticulatis, petalis transverse bilobis ciliatis, labelli laminis ellipticis ciliatis, appendicibus duobus brevibus ciliatis.

Plant small to medium in size, epiphytic, caespitose; roots filamentous. Secondary stems slender, erect, 4-6 cm long, enclosed by 9-11 ciliate lepanthiform sheaths with dilated ostia. Leaf erect, coriaceous, elliptical, 4-5 cm long, 1-1.4 cm wide, the apex acute, long-acuminate, tridenticulate with the middle tooth elongated, the base cuneate into a petiole 1.5 mm long. Inflorescence a dense, distichous, successively flowered raceme up to 5 mm long, borne on top of the leaf by a filiform peduncle 12-22 mm long; floral bract 1.25 mm long; pedicel 2 mm long; ovary 2 mm long; sepals yellow, suffused with red, denticulate, carinate-spiculate, the laterals fimbriate, the dorsal sepal broadly ovate, obtuse, 3.5 mm long, 2 mm wide, connate 1 mm to the lateral sepals, the lateral sepals ovate, subacute, connate 1 mm, 3.5 mm long, 1.6 mm wide; petals red-purple, short-pubescent, long-ciliate, transversely bilobed, 0.6 mm long, 2.1 mm wide, the lobes subequal, subfalcate with rounded ends; lip red-purple, the blades narrowly elliptical, 1.66 mm long, long-ciliate, the ends narrowly obtuse, the connectives short and broad forming a broad body attached to the base of the column, the obtuse sinus with a pair of equal, short, oblong, ciliate appendices; column slender, 2 mm long, the anther and stigma apical.

Etymology: From the Latin bifarius, "double," in reference to the pair of similar appendices.

Type: Ecuador: Prov. of Pichincha: Tandapi, alt. 2000 m, July 1983, A. Hirtz 1013 (Holotype: SEL), C. Luer illustr. 9156.

This species is superficially similar to many others with long-acuminate leaves and a short, congested inflorescence, but the lateral sepals are fimbriate, the petals and blades of the lip are long-ciliate, and the appendix is double, both appendices being short and ciliate, side by side in a broad sinus.

Lepanthes brunnescens Luer, sp. nov.

Planta mediocris debilis, foliis floribusque brunneis, folio ovato acuminate inflorescentia longiore, racemo congestissimo longipedicellato, sepalis ovatis, petalis transverse trilobis, lobo superiore cuneato integro, lobo inferiore apice truncato eroso, lobo mediano setiformi, labelli lamina oblongis agglutinatis, appendice crasso cymbiformi pubescenti.

Plant medium in size, epiphytic, caespitose, weak; roots filamentous. Secondary stems slender to suberect or horizontal, 2-8 cm long, enclosed by 5-10 close, microscopically ciliate lepanthiform sheaths. Leaf erect, thinly coriaceous, satiny brown, ovate, 2-4 cm long, 0.8-1.7 cm wide, the apex acuminate, acute, the rounded base contracted into a petiole 1 mm long. Inflorescence a very congested, long-pedicellate raceme up to 4 mm long, borne on top of the leaf by a filiform peduncle 6-15 mm long; floral bract 1 mm long; pedicel 4-4.5 mm long; ovary 1 mm long; sepals translucent tan, the dorsal sepal ovate, acute, 3.25 mm long, 2.75 mm wide, connate to the lateral sepals for 1 mm, the lateral sepals connate 1.5 mm into an ovate, broadly bifid lamina 3 mm long, 3 mm wide, the apices subacute; petals brown, microscopically pubescent, transversely trilobed, 1.5 mm long, 4.5 mm wide, the upper lobe cuneate with rounded angles of the apex, the lower lobe cuneate with the truncate apex erose, the middle lobe setiform, 1 mm long, from the outer margin at the middle; lip dark brown, microscopically cellular-pubescent, the blades oblong, 1.8 mm long, agglutinated medially over the column, the apices subtruncate, the bases narrowly obtuse, the connectives short, broadly cuneate from the middle of the blades, connate to the column above the base, the appendix from the sinus, large, oblong-cymbiform, pubescent, with an apical gland; column 2 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Latin *brunnescens*, "becoming brown," referring to the color of the leaves and flowers.

Type: Panama: Prov. of Panama: epiphytic in cloud forest, Cerro Jefe, alt. 900 m, 1 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9200 (Holotype: SEL).

This relative of the common South American L. mucronata Lindl. is characterized by the overall brown color, a long-pedicellate, congested raceme, petals with the lower lobe erose, and a lip with broad connectives from the middle of the blades, and a large, boat-shaped appendix with figurehead.

Lepanthes caloptera Luer, sp. nov.

Planta parva, inflorescentia folio elliptico breviter acuminato brevior, racemo congesto disticho, petalis transverse bilobis sepalis ovatis longioribus, lobis petalorum subaequalibus subfalcatis et obtuse angulatis, labelli laminis ovalibus, appendice crassa digitiformi.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 15-27 mm long, enclosed by 4-6 dark brown, minutely ciliate lepanthiiform sheaths. Leaf erect, coriaceous, broadly elliptical, 22-27 mm long, 13-15 mm wide, the apex subacute to obtuse, lightly acuminate, the base broadly cuneate into the petiole 2 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 5 mm long, borne on top of the leaf by a filiform peduncle 10-12 mm long; floral bract muricate, 1 mm long; pedicel 2-3 mm long; ovary 1.5 mm long; sepals translucent white, ovate, lightly acuminate, acute, the dorsal sepal 4.5 mm long, 3.25 mm wide, connate to the lateral sepals for 1 mm, the lateral sepals connate 2 mm into a broadly bifid lamina 4 mm long, 3 mm wide; petals yellow, suffused with purple medially, microscopically pubescent, transversely bilobed, 1 mm long, 5 mm wide, 3-veined, the lobes subequal, subfalcate, each with an obtuse angle on the outer margin; lip red-purple, minutely pubescent, the blades ovate with rounded ends, 1 mm long, the connectives short, cuneate, connate to the column above the base, the appendix thick, oblong, pubescent, at the sinus, protruding immediately beneath the stigma; column 1 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Greek calos, "beautiful," and pteron, "wing," referring to the petals of the species.

Type: Panama: Prov. of Panama: epiphytic in cloud forest, Cerro Jefe, alt. 900 m, 1 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9194 (Holotype: SEL).

This species with a congested raceme shorter than the elliptical leaf is most remarkable for the more or less equally falcate lobes of the petals longer than the sepals, and a thick, fingerlike appendix in close proximity to the stigma.

Lepanthes coeloglossa Luer, sp. nov.

Planta perparva, inflorescentia foliis ellipticis plus minusve longiore, racemo congesto disticho, sepalis ovatis subaequalibus pro parte maxima libris, petalis bilobis, lobo superiore oblongo, lobo inferiore falcato, labelli laminis oblongis corpore protuberanti et excavata.

Plant very small, epiphytic, caespitose; roots filiform. Secondary stems slender, erect, 15-25 mm long, enclosed by 3-4 microscopically ciliate lepanthiiform sheaths. Leaf erect, coriaceous, elliptical, the blade 9-10 mm long, 6-7 mm wide, the apex subacute to obtuse, the base broadly cuneate into the petiole 2 mm long. Inflorescence a congested, distichous, successively flowered raceme

up to 4 mm long on top of the leaf, by a filiform peduncle 6-10 mm long; floral bract 1-1.25 mm long, muricate; pedicel 1-1.5 mm long; ovary 0.9 mm long; flowers yellow; sepals ovate, acute, 2 mm long, 1.25 mm wide, connate basally for 0.25-0.5 mm; petals transversely bilobed, 0.4 mm long, 1.5 mm wide, the upper lobe oblong with the apex rounded, the lower lobe falcate, narrowly obtuse; lip glabrous, the blades oblong, 0.6 mm long, the apices truncate, the bases round, the connectives thick, cuneate, the body with a central, round cavity just above the connation to the base of the column, the sinus protuberant, rounded, apiculate; column 0.6 mm long, the anther and stigma apical.

Etymology: From the Greek koilos, "hollow," and glossa, "tongue," referring to the rounded excavation on the lip.

Type: Panama: Prov. of Chiriqui: epiphytic in elfin forest on Cerro Hornito, alt. 1700 m, 15 Dec. 1976, C. Luer, A. Luer, R. L. Dressler & N. H. Williams 1357 (Holotype: SEL).

This little species may be identified by the congested raceme borne by a peduncle about as long as the elliptical leaf. The sepals are subequal and nearly free; the lower lobe of the petals is falcate; and the body of the lip has a central, round excavation.

Lepanthes deliqua Luer, sp. nov.

Planta parva, racemis paucis laxae flexuosae folio elliptico plus minusve longioribus, sepalis denticulatis acuminatis, petalis anguste transverse oblongis, labelli laminis suborbiculatis pubescentibus connectivis angustis, corpore appendiceque deliquis.

Plant small, epiphytic, caespitose; roots filiform. Secondary stems slender, erect, 3.5-5.5 cm tall, enclosed by 5-7 minutely ciliate lepanthiform sheaths. Leaf erect, coriaceous, elliptical, obtuse, 22-25 mm long, 8-12 mm wide, cuneate below to the subpetiolate base. Inflorescence a loose, flexuous, progressively lengthening raceme 1.5-5 cm long including the filiform peduncle ca. 1 cm long; floral bract 1.5 mm long, muricate; pedicel 1.5 mm long; ovary 1 mm long; sepals yellow, diffusely suffused with purple, carinate, minutely denticulate, the dorsal sepal ovate, concave, acute, acuminate, 6 mm long, 2.5 mm wide, connate basally for 0.75 mm to the lateral sepals, the lateral sepals ovate, oblique, connate 3 mm, 6.5 mm long, 3.75 mm wide together, the apices acute, acuminate into slender, incurved tails; petals yellow, suffused with purple medially, narrowly transversely oblong, minutely pubescent, 0.6 mm long, 3.5 mm wide, the lobes narrowly triangular-oblong, narrowly obtuse, the lower lobe longer; lip purple, the blades minutely pubescent, suborbicular, 1.33 mm long and wide, deflexed to surround the apical half of the column, the connectives narrowly cuneate from the bases of the blades to the connection directly to the under surface of the column near the middle without forming a body or appendix; column 1.5 mm long, decurved-arcuate, the anther dorsal with a large, bifurcated cap, the stigma ventral.

Etymology: From the Latin deliquus, "lacking, wanting," referring to the total absence of the body and appendix of the lip.

Type: Ecuador: Prov. of Chimborazo: La Palma, alt. 2800 m, July 1983, A. Hirtz 1255 (Holotype: SEL), C. Luer illustr. 9155.

This species is most unusual for the complete absence of a body and appendix of the lip. The round blades of the lip surround the arcuate column, and they are suspended by narrow connectives that originate directly from the under surface of the column without prior union into a body. Consequently, there is no trace of an appendix.

Lepanthes demissa Luer, sp. nov.

Planta mediocris debilis, foliis tenuibus anguste ovatis inflorescentia longioribus, racemo congesto disticho, sepalis ovatis microscopicamente denticulatis, petalis parvis transverse oblongis, labelli lamina anguste oblongis connectivis late cuneatis, appendice extus minuta pubescenti.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems weak, slender, erect to transverse, 3-9.5 cm long, enclosed by 6-11 lepanthiform sheaths with minutely ciliate, dilated ostia. Leaf erect to suberect, thinly coriaceous, narrowly ovate, acuminate, acute, 3.5-5.5 cm long, 8-12 mm wide, the base cuneate into a 1 mm long petiole. Inflorescence a congested, distichous raceme up to 5 mm long, borne on top of the leaf by a filiform peduncle 10-24 mm long; floral bract 2 mm long, lightly muricate; pedicel 1.5 mm long, ovary 1.5 mm long, 6-carinate; sepals dull tan, ovate, acute, carinate-spiculate, the margins cellular-denticulate, the dorsal sepal 5 mm long, 2.6 mm wide, connate to the lateral sepals for 0.5 mm, the lateral sepals connate 1 mm, 5 mm long, 1.8 mm wide; petals orange-brown, microscopically pubescent, transversely oblong, 0.5 mm long, 1.8 mm wide, the ends of the lobes rounded, the lower lobe much smaller than the upper lobe; lip orange-brown, microscopically pubescent, the blades narrowly oblong, 1.4 mm long, the apices narrowly obtuse, incurved, the bases narrowly rounded, the connectives broadly cuneate, connected to the base of the column, the body with a small round cavity near the protuberant, rounded, pubescent sinus, the body pubescent externally with a minute, pedunculated, pubescent appendix; column 1.4 mm long, the anther and stigma apical.

Etymology: From the Latin demissus, "drooping, weak," in reference to the habit of the plant.

Type: Panama: Prov. of Chiriqui: epiphytic in cloud forest above Guadalupe, alt. 2300 m, 8 Dec. 1983, C. Luer, J. Luer & A. Maduro 2922 (Holotype: SEL).

This species is characterized by the thin, weak stems with a congested inflorescence on top of the thin, narrowly ovate, acuminate leaf. The sepals are cellular-denticulate, the petals are small, and the appendix is minute and pubescent on the under surface of the body of the lip.

Lepanthes echidna Luer & Vásquez, sp. nov.

Herba parva, folio ovato breviter acuminato inflorescentia flexuosa longiore, sepalis acutis, lateralium marginibus ambabus inflexis cristatis, petalis transverse oblongis, labelli laminis lunatis pubescentibus, appendice nulla.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 1-6 cm long, enclosed by 3-8 ciliate lepanthiiform sheaths with dilated apices. Leaf erect, coriaceous, the blade ovate, obtuse, shortly acuminate, 17-23 mm long, 10-13 mm wide, the rounded base contracted into a petiole 4-5 mm long. Inflorescence a subdense, flexuous, successively flowered raceme up to 11 mm long, borne behind the leaf by a filiform peduncle 7 mm long; floral bract 2 mm long, ciliate; pedicel 2.25 mm long; ovary 1 mm long; sepals triangular, concave, acute with setiform apices, the dorsal sepal purple, 6 mm long, 3 mm wide, connate to the lateral sepals for 1 mm, tricarinate, the carinae irregularly ciliate-fringed, the lateral sepals yellow, suffused with purple centrally, unicarinate, similarly fringed, 7 mm long, 3 mm wide, connate less than 1 mm, both margins sharply folded with a fringed lamella along the creases; petals purple, shortly pubescent, transversely oblong, 1 mm long, 3 mm wide, the lobes subequal, oblong with rounded ends; lip rose, shortly pubescent, the blades lunate, 1.8 mm long, the apices narrowly obtuse, incurved, the bases rounded, the connectives broadly cuneate, originating with the base of the column, the sinus obtuse without an appendix; column 1.5 mm long, the anther and stigma apical.

Etymology: From the Greek echidna, "a viper," or the genus of spiny anteaters, Echidna, referring to the prickly exterior of the flower.

Type: Bolivia: Dept. of Chapare: epiphytic in cloud forest between Cochabamba and Villa Tunari, alt. 1850 m, 17 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9386 (Holotype: SEL).

This unusual species, another member of the Bolivian "complicata" group, is distinguished by the crested, folded margins of both sides of the lateral sepals. It seems closely related to L. ptyxis and L. zongoensis Luer & Vásquez.

Lepanthes empis Luer, sp. nov.

Planta minuta, inflorescentia foliis late ellipticis brevior, racemo congesto disticho, floribus minutissimis, sepalis ovatis acutis, petalis transverse bilobis multangulatis, labelli laminis oblongis, appendice ovoidea pubescenti transverse fissa.

Plant minute, epiphytic, caespitose; roots comparatively coarse. Secondary stems erect, slender, 3-17 mm tall, enclosed by 2-4 microscopically pubescent lepanthiiform sheaths. Leaf erect, coriaceous, broadly elliptical, obtuse, the blade 5-11 mm long, 4-6 mm wide, the base cuneate into a twisted petiole 1 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 4 mm long, borne behind the leaf by a filiform peduncle 3-4 mm

long; floral bract and pedicel each 0.75 mm long; ovary 0.75 mm long; sepals light green to rose, ovate, acute, the dorsal sepal 1.8 mm long, 1 mm wide, the lateral sepals 1.8 mm long, 0.9 mm wide, connate 0.8 mm; petals purple to orange margined in purple, glabrous, at most cellular, transversely bilobed, 0.5 mm long, 1.2 mm wide, with a minute, obtuse angle near the middle of the outer margin, the upper and lower lobes subequal, more or less ovate, obtusely angled on the outer margins, the apices rounded; lip glabrous, at most cellular, purple, the blades oblong, 0.6 mm long with rounded ends, the connectives cuneate from the bases of the blades, connate to the column above the base, the sinus filled with a proportionately large, pubescent, ovoid appendix with the apex transversely cleft.

Etymology: From the Greek empis, "a gnat or mosquito," referring to the minute flowers.

Type: Panama: Prov. of Chiriqui: epiphytic in small trees near Volcan, "La Cordillera," alt. 1300 m, 9 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9314 (Holotype: SEL).

This minute species, one of the smallest in the genus, is characterized by the short, congested raceme, the entire sepals, the multangular petals, and the proportionately large ovate appendix cleft transversely.

Lepanthes epibator Luer & Vásquez, sp. nov.

Herba mediocris debilis scandens, inflorescentia racemosa subdensa folio anguste ovato brevior, petalis minutis transverse oblongis, labelli laminis oblongis pubescentibus, appendice oblonga longi-pubescenti.

Plant small to medium in size, epiphytic, scandent; roots from the apices of secondary stems, slender. Secondary stems slender, proliferating from the apices of other secondary stems, 4-8 cm long, enclosed by 5-8 close, minutely ciliate, lepanthiform sheaths. Leaf erect, coriaceous, narrowly ovate, acute, 2.5-4.5 cm long, 0.6-0.9 cm wide, the base cuneate into a petiole 2-3 mm long. Inflorescence a subdense, successively flowered raceme up to 20 mm long, produced on top of the leaf by a filiform peduncle 4-6 mm long; floral bract 1 mm long; pedicel 1.25 mm long; ovary 1.5 mm long; sepals white, ovate, acute, shortly acuminate into narrow apices, the dorsal sepal 3.2 mm long, 2.5 mm wide, connate 1 mm to the lateral sepals, the lateral sepals oblique, connate 1 mm, 3 mm long, 2.8 mm wide together; petals red-purple, pubescent, transversely oblong, 0.4 mm long, 1 mm wide, the lobes subequal, oblong, rounded; lip red-purple, the blades oblong with rounded ends, 1.2 mm long, the connectives broadly cuneate, the body connected to the column above the base, the sinus narrow with a comparatively large, oblong, long-pubescent appendix; column red-purple, 1 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Greek epibator, "a climber," referring to the scandent habit.

Type; Bolivia: Dept. of La Paz: Prov. of Sud Yungas: epiphytic in cloud forest east of Unduavi, alt. 3100 m, 22 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9409 (Holotype: SEL).

This species may be distinguished from the other two scandent species of Lepanthes with racemes shorter than the leaves by the weak habit, the very small flowers, and the comparatively large, long-pubescent appendix.

Lepanthes frigida Luer, sp. nov.

Planta mediocris, racemis laxe plurifloris folio anguste elliptico brevioribus vel longioribus, sepalis acutis denticulatis, petalis transverse oblongis, labelli laminis oblongis apice acutis incurvis, connectivis latissimis, appendice minuta pedunculata.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems relatively stout, erect, 5-11 cm long, enclosed by 6-8 close lepanthiform sheaths with ciliate ostia. Leaf erect, coriaceous, narrowly elliptical, acute, 4.5-6.5 cm long including the 2-3 mm long petiole, 7-11 mm wide, the base cuneate into the petiole. Inflorescence racemose, 2-3 loose, distichous, successively several-flowered racemes up to 9 cm long including the 5-8 mm long, slender peduncle; floral bract 1.5 mm long; pedicel 1 mm long; ovary 1 mm long; sepals yellow to orange, minutely denticulate, the dorsal sepal elliptic-ovate, acute, 4.3 mm long, 2.5 mm wide, connate basally to the lateral sepals for 0.75 mm, the lateral sepals ovate, oblique, 1-veined, connate 1.5 mm, 4.3 mm long, 3 mm wide together; petals yellow with red margins, microscopically pubescent, transversely oblong, 0.75 mm long, 2.5 mm wide, with a small, obscure angle on the outer margin between the lobes, both lobes oblong, obtuse, the upper lobe twice longer than the lower lobe; lip yellow with red margins, microscopically pubescent, the blades oblong, 1.4 mm long, the apices broad, acute, incurved, the bases obtuse, the connectives broadly cuneate, connected to the column below the middle, the sinus acute, with a minute, pedunculated, ciliate appendix; column 2 mm long, the anther and stigma apical.

Etymology: From the Latin frigidus, "cold," referring to the cold, high altitude of the habitat.

Type: Ecuador: Prov. of Chimborazo: La Palma, alt. 3600 m, July 1983, A. Hirtz 1249 (Holotype: SEL), C. Luer illustr. 9158.

This species, a member of the group with an apical stigma, is notable for the narrowly elliptical leaves with loose inflorescences that begin flowering from near the base and continue until the raceme is about twice as long as the leaf. The sepals are acute and denticulate, the petals are transversely oblong, the apices of the lip are broadly incurved beneath the apex of the column, and the appendix is minute and pedunculated.

Lepanthes infundibulum Luer, sp. nov.

Planta mediocris, foliis patentibus suborbicularibus vel transverse ovatis infundibuliformibus, inflorescentia racemosa congesta brevi, sepalis ellipticis petalis transverse bilobis brevioribus, labelli laminis ovatis apicibus acuminatis incurvis, sinu cum caespiti villosa.

Plant medium in size, epiphytic, caespitose; roots filiform. Secondary stems relatively stout, erect, 2.5-5 cm long, enclosed by 5-6 blackish, minutely ciliate lepanthiiform sheaths. Leaf suberect to spreading, coriaceous, suborbicular to transversely ovate, concave to funnel-shaped, from 15 mm long, 13 mm wide, to 25 mm long, 23 mm wide, the apex round to obtuse, the rounded base contracted into a petiole 1-3 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 6 mm long, borne on top of the leaf by a filiform peduncle 9-12 mm long; floral bract 1-1.25 mm long, pedicel 1 mm long; ovary 2 mm long; sepals yellow, elliptic, subacute, the dorsal sepal 2.5 mm long, 1.25 mm wide, connate to the lateral sepals for 0.5 mm, the lateral sepals connate 1 mm, 2.5 mm long, 1 mm wide; petals yellow, suffused and edged in red, pubescent, transversely bilobed, 1 mm long, 3.5 mm wide, the lobes subtriangular, narrowly obtuse, the upper lobe obtusely angled on the inner margin, slightly larger than the lower lobe; lip red-purple, the blades ovate, 1.2 mm long, minutely ciliate, the apices narrowly acuminate, acute, incurved beneath the column, the bases rounded, the connectives cuneate, connate to the column above the base, the sinus rounded, the appendix a tuft of villous hairs; column slender with a large anther-bed, 1.4 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Latin infundibulum, "a funnel," in reference to the shape of the leaves.

Type: Panama: Prov. of Chiriqui: epiphytic in elfin forest, Cerro Hornito, alt. 1700 m, 15 Dec. 1976, C. Luer, A. Luer, R. L. Dressler & N. H. Williams 1331 (Holotype: SEL).

The habit of this species is most unusual in the funnel-like shape of the broad leaves. The inflorescence is borne within the cup. The flowers are small, the petals longer than the sepals. The apices of the blades of the lip are narrow and curve under the large apex of the slender column. The appendix is reduced to a tuft of straight hairs in the sinus.

Lepanthes maduroi Luer, sp. nov.

Planta mediocris, racemo laxe plurifloro folium duplo superanti, floribus grandibus ferrugineis, sepalis ovatis leviter acuminatis, petalis transverse oblongis parvis, labelli laminis anguste oblongis apice incurvatis, sinu minute ciliato appendice destituta.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems slender, erect to suberect, 2.5-8 cm long, enclosed by 5-9 lepanthiiform sheaths with dilated, ciliate stomata. Leaf

erect, coriaceous, elliptical, 2.5-4 cm long, 1-1.7 cm wide, the apex lightly acuminate, acute, the base cuneate into the 1-2 mm long petiole. Inflorescence a loose, subflexuous, flexible, successively several-flowered raceme up to 4 cm long, borne by a filiform peduncle 3-4.5 cm long; floral bract 1.5-2 mm long, lightly muricate; pedicel 2 mm long; ovary 2 mm long, 6-carinate; sepals reddish tan or brown, ovate, lightly acuminate, acute, carinate, the dorsal sepal 9.5 mm long, 6.25 mm wide, connate to the lateral sepals for 2 mm, the lateral sepals connate 3 mm, 9.25 mm long, 4.5 mm wide; petals red-brown, microscopically pubescent, transversely oblong, 1 mm long, 3.5 mm wide, the ends of the lobes rounded, the lower lobe narrower and slightly incurved; lip red-brown, glabrous except for microscopic cilia at the apices of the blades, the blades narrowly oblong with narrowly rounded ends, 2 mm long, the apices incurved beyond the column, the connectives broadly cuneate, connate to the column above the base, the sinus minutely ciliate without an appendix; column 2 mm long, the anther and stigma apical.

Etymology: Named in honor of Sr. Andres Maduro of Panama, Panama, who has collected this species, and has cultivated it successfully for several years.

Type: Panama: Prov. of Chiriqui: epiphytic in cloud forest above Guadalupe, alt. 2300 m, 8 Dec. 1983, C. Luer, J. Luer & A. Maduro 9305 (Holotype: SEL).

This handsome, large-flowered species with racemes exceeding the leaves grows intermixed with L. maxonii Schltr. The reddish tan sepals are shortly acuminate and tailless.

Lepanthes mariposa Luer, sp. nov.

Planta perpusilla, inflorescentia brevi racemosa congesta super folio crasso elliptico, petalis late bilobis sepalis ellipticis subaequantibus, lobis suborbiculatis, labelli laminis suborbiculatis convexis, connectivis brevibus, appendice ligulata pubescenti.

Plant very small, epiphytic, densely caespitose; roots filamentous. Secondary stems erect to suberect, 7-25 mm long, enclosed by 3-5 microscopically pubescent lepanthiform sheaths. Leaf more or less spreading, thickly coriaceous, elliptical, acute, 10-16 mm long, 5-8.5 mm wide, the base cuneate into a petiole 2 mm long. Inflorescence a congested, secund, successively flowered raceme up to 3 mm long, borne on top of the leaf by a filiform peduncle 2-4 mm long; floral bract 0.75 mm long; pedicel 1 mm long; ovary 1 mm long; sepals light yellow, elliptical, subacute to obtuse, the dorsal sepal 2 mm long, 1.5 mm wide, connate to the lateral sepals for 0.25 mm, the lateral sepals 2 mm long, 1.25 mm wide, connate 0.5 mm; petals yellow to orange or orange-brown, more or less suffused with purple, glabrous, or at the most cellular, transversely bilobed, nearly as large as the sepals, 1 mm long, 2 mm wide, the lobes more or less suborbicular, subequal; lip bright purple, the blades cellular, suborbicular, convex, 1.2 mm long, the connectives cuneate, short, from near the base of the blades, to form a narrow body, con-

nate to the column above the base, the appendix proportionately large, ligulate, pubescent; column 0.8 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Spanish mariposa, "a butterfly," in allusion to the appearance of the petals.

Type: Panama: Prov. of Chiriqui: epiphytic in scrubby trees near Volcan, alt. 1350 m, 7 Dec. 1983, C. Luer, J. Luer & H. Butcher 9278 (Holotype: SEL): epiphytic, La Cordillera, near Volcan, alt. 1300 m, 9 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9310 (SEL); epiphytic in cloud forest, Cerro Colorado, alt. 1700 m, 16 Feb. 1977 C. Luer, J. Luer & R. L. Dressler 1598 (SEL).

This floriferous little species with short racemes on top of the little ovate leaves is easily recognized by the large pair of petals that spread like the wings of a butterfly to either side of the lip and column.

Lepanthes megalocephala Luer & Vásquez, sp. nov.

Planta perpusilla, racemo grandifloro congesto folio ovato reticulato brevior, sepalis ovatis ciliatis, petalorum lobis anguste triangularibus pubescentibus, labelli laminis anguste ovatis longiciliatis, connectivis anguste cuneatis, corpore nullo, appendice oblonga pubescenti.

Plant very small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 5-10 mm long, enclosed by 4-5 microscopically scabrous lepanthiiform sheaths. Leaf erect, coriaceous, purple beneath, reticulated, ovate, subacute, 8-10 mm long, 6-7 mm wide, the rounded base contracted into a petiole 1 mm long. Inflorescence a congested, distichous, successively large-flowered raceme up to 5 mm long, borne behind the leaf by a filiform peduncle 3-5 mm long; floral bract ciliate, 0.75 mm long; pedicel 0.75 mm long; ovary 1.5 mm long; sepals red with yellow margins, triangular-ovate, acute, densely ciliate and carinate ciliate, the dorsal sepal 4.5 mm long, 3 mm wide, connate to the lateral sepals for 1 mm, the lateral sepals 4.5 mm long, 2 mm wide, connate for 1.5 mm, minutely pubescent above the middle; petals red-orange, pubescent, transversely bilobed, 3.75 mm wide, 1 mm long, the lobes narrowly triangular, acute, the upper larger; lip yellow, suffused with red-orange, the blades linear-ovate, 2 mm long, long-ciliate, the ends narrowly obtuse, the connectives narrowly cuneate, originating from the base of the column without forming a body, the sinus acute, with an oblong, truncate, pubescent appendix; column slender, 2 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Latinized Greek megaloccephalus, "with a large head," referring to the comparatively large flower for the plant.

Type: Bolivia: Prov. of Chapare: epiphytic in cloud forest between Cochabamba and Villa Tunari, alt. 1850 m, 29 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9470 (Holotype: SEL).

This tiny species, found by Roberto Vásquez, produces on a short peduncle a brightly colored flower as large as the reticulated leaf. The sepals are densely ciliate, the narrowly triangular lobes of the petals are pubescent, the linear blades of the lip are long-ciliate, and the connectives do not form a body.

Lepanthes menatoi Luer & Vásquez, sp. nov.

Planta grangis, inflorescentia racemosa congestissima brevipedicellata folio elliptico breviter acuminato brevior, sepalis acutis, petalis bilobis, lobo superiore truncato, lobo inferiore anguste triangulari, labelli laminis oblongis convexis parvis marginibus interioribus longiciliatis, appendice oblonga pubescenti.

Plant large, epiphytic, caespitose; roots coarse. Secondary stems stout, erect, 17-24 cm long, enclosed by 11-12 ciliate lepanthiform sheaths. Leaf erect, thinly coriaceous, elliptical, 8-8.5 cm long, 3.7-4 cm wide, the apex subacute, lightly acuminate, the base broadly cuneate into a petiole 2-3 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 3 cm long, borne either behind or in front of the leaf by a filiform peduncle up to 3.5 cm long; floral bract 1.5 mm long; pedicel 1.5 mm long; ovary 3.5 mm long; sepals yellow, glabrous, the dorsal sepal triangular, acute, 8 mm long, 5.5 mm wide, connate to the lateral sepals for 1.5 mm, the lateral sepals semilunate, connate 3.5 mm into an ovate synsepal 7.5 mm long, 7 mm wide, the apices subacute, approximate; petals yellow, suffused with red, essentially glabrous, transversely bilobed, 1.25 mm long, 4 mm wide, the upper lobe oblong, truncate, the lower lobe narrowly triangular, oblique, acute; lip yellow, suffused with red, the blades oblong, convex, with rounded ends, 1.25 mm long, the surfaces and outer margins glabrous, the inner margins and bases long-ciliate, the connectives narrowly oblong from the bases of the blades, long-ciliate anteriorly, the body originating from the end of the ovary with the column, the sinus broad with a small, oblong, pubescent appendix; column 1 mm long, expanded at the apex, the anther dorsal, the stigma ventral.

Etymology: Named in honor of Don Dino Menato of Chulumani, Bolivia, who discovered and cultivated this species.

Type: Bolivia: La Paz: Prov. of Sud Yungas: without specific locality, cultivated by Dino Menato in Chulumani, flowered in cultivation 26 Jan. 1984, C. Luer 9428 (Holotype: SEL).

This large, yellow-flowered species is yet another in the widespread *elata*-monitor complex. Lepanthes menatoi, however, is easily identified by the small oblong lobes of the lip with long-ciliate, inner margins, the hairs spreading over the column.

Lepanthes microtica Luer & Escobar, sp. nov.

Planta parva, foliis ovatis inflorescentia longioribus, racemo congesto, sepalis ellipticis lateralibus alte connatis, petalis perparvis transverse oblongis, labelli laminis minute pubescentibus anguste ovatis columna brevioribus, appendice minuta triangulari.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 1.5-5 cm long, enclosed by 4-7 microscopic ciliate-scabrous lepanthiform sheaths. Leaf erect, coriaceous, ovate, subacute to obtuse, 10-15 mm long, 6-9 mm wide, the rounded base contracted into a petiole 1 mm long. Inflorescence a congested raceme up to 4 mm long, borne on top of the leaf by a filiform peduncle up to 6 mm long; floral bract 0.75 mm long, lightly echinate; pedicel 0.5 mm long; ovary 1 mm long; sepals elliptical, subacute, the dorsal sepal translucent rose, minutely apiculate, tricarinate, 2.75 mm long, 1.5 mm wide, the lateral sepals light orange, connate 1.5 mm into a suborbicular, bifid lamina 2.5 mm long, 2.25 mm wide; petals orange, suffused with purple, transversely oblong, 0.3 mm long, 1 mm wide, microscopically cellular-glandular, the lobes subequal, oblong-triangular with rounded apices; lip light purple, minutely pubescent, the blades narrowly ovate, 1 mm long with rounded ends, the connectives cuneate, connate to the column above the base, the obtuse sinus with a small, triangular appendix; column 1.3 mm long, the anther and stigma apical.

Etymology: From the Greek micro-, "little," and otikos, "pertaining to ears," in reference to the small petals.

Type: Costa Rica: Prov. of San José: road to Santa Maria de Dota, alt. 2240 m, 23 July 1983, R. Escobar 3070 (Holotype: SEL), C. Luer illustr. 9132; Prov. of Cartago: La Chonta, along the Pan American highway, alt. 2450, 6 Aug. 1983, R. Escobar 3158 (SEL).

This species may be recognized by the little ovate leaves with a short, congested raceme. The lateral sepals are connate to near the apices, the transversely oblong petals are minute, and the lobes of the lip are smaller than the column.

Lepanthes plumifera Luer, sp. nov.

Planta mediocris, inflorescentia racemosa congesta folio ovato acuminato dimidio brevior, sepalo dorsali synsepaloque transverse ovatis, petalis transverse ellipticis bobis acutis, labelli laminis fusiformibus, appendice magna pilosa protrudenti.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 6-9 cm long, enclosed by 6-8 close, minutely ciliate lepanthiform sheaths. Leaf suberect, thinly coriaceous, ovate, acuminate, 4-5.5 cm long, 2.2-2.5 cm wide, the round base abruptly contracted into a petiole 2 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 8 mm long, borne behind the leaf by a filiform peduncle up to 10 mm long; floral bract 1 mm long, muricate; pedicel 1.5 mm long; ovary 1 mm long; sepals yellow, minutely denticulate, the dorsal sepal transversely ovate, subacute, 2.66 mm long, 3 mm wide, connate to the lateral sepals for 1 mm, the lateral sepals connate 1.5 mm into a transversely ovate lamina 2.8 mm long, 3.2 mm wide, the apices acute, oblique, free for 0.66 mm; petals orange, suffused with purple, transversely bilobed, minutely pubescent, 1 mm long, 3.5 mm wide,

the upper lobe triangular-oblong, acute, the lower lobe shorter, triangular, acute; lip orange, suffused with purple, the blades fusiform, 1 mm long with acute ends, embracing the column, the connectives obliquely cuneate from the apical halves of the blades, each with a rounded below the attachment to the under surface of the column below the middle, the appendix comparatively large, pilose, triangular, acute, protruding forward beyond the apices of the blades; column 0.75 mm long, the anther dorsal, the stigma ventral.

Etymology; From the Latin pluma, "feather," and -fer, "bearing," referring to the featherlike appendix.

Type: Ecuador: Prov. of El Oro: epiphytic in cloud forest west of Pinas, alt. 1000 m, 25 Sept. 1980, C. Luer, J. Luer, C. H. Dodson et al. 5542 (Holotype: SEL).

The flowers of this species are very small with broad, denticulate sepals and pointed petals. The narrow blades of the lip hug the column, and protruding from beneath is the featherlike appendix.

Lepanthes prora Luer, sp. nov.

Planta parva, inflorescentia foliis orbiculatis brevior, racemo congesto disticho, sepalis triangularibus denticulatis, petalis transverse bilobis pubescentibus, lobis triangularibus acutis, labelli laminis pubescentibus oblongis, appendice crassa cymbiformi.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 15-25 mm long, enclosed by 4-5 dark brown, microscopically ciliate lepanthiiform sheaths. Leaf erect, coriaceous, suborbicular, the blade 11 mm long and 10 mm wide to 22 mm long and 19 mm wide, the apex rounded, the base rounded, contracted into a petiole 2 mm long. Inflorescence a congested, distichous, successively flowered raceme 3 mm long, borne behind the leaf by a filiform peduncle 4-5 mm long; floral bract muricate, 1 mm long; pedicel 1-1.5 mm long; ovary 1 mm long; sepals light yellow, ovate-triangular, acute, minutely denticulate, low-carinate-denticulate along the veins externally, the dorsal sepal 4 mm long, 2.5 mm wide, connate 0.75 mm to the lateral sepals, the lateral sepals connate 1 mm, 3.75 mm long, 2 mm wide; petals yellow, suffused with red, minutely pubescent, transversely bilobed, 0.75 mm long, 3 mm wide, the lobes triangular, acute, the upper lobe twice longer than the lower lobe; lip yellow, minutely pubescent, the blades oblong, 1.25 mm long, the apices acute, curved under the column, the bases rounded, the connectives broadly cuneate, the body connected to the base of the column, the appendix stout, cymbiform, pubescent; column 1.5 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Greek prora, "the bow of a boat," referring to the shape of the appendix.

Type: Panama: Prov. of Panama: epiphytic in cloud forest, Cerro Jefe, alt. 900 m, 1 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9207 (Holotype: SEL).

This species is characterized by round leaves; a short inflorescence; minutely denticulate sepals; pubescent, pointed petals; and a thick, pubescent appendix that resembles the prow of a boat.

Lepanthes psyche Luer, sp. nov.

Planta mediocris, foliis crassis ellipticis breviter acuminatis inflorescentia longioribus, racemo congesto disticho, sepalo dorsali synsepaloque late ovatis, petalis grandibus cum dente marginali, lobo superiore suborbiculato glabro, labelli laminis agglutinatiss, appendice ligulata convexa cum parte terminali concava.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems slender, erect to horizontal or pendent, 4-6 cm long, enclosed by 4-5 close, minutely ciliate lepanthiiform sheaths. Leaf erect to drooping, thickly coriaceous, more or less concave, often coppery in color, more or less suffused with purple beneath, elliptical, 3-5.5 cm long, 1.5-3.5 mm wide, the apex shortly acuminate, acute, the base cuneate into a petiole 2-5 mm long. Inflorescence a congested, distichous raceme up to 10 mm long, borne on top of the leaf by a filiform peduncle 15-20 mm long; floral bract 1 mm long; pedicel 2 mm long; ovary 2.5 mm long; sepals yellow to tan, the dorsal sepal broadly ovate, obtuse, 3 mm long, 2.5 mm wide, the lateral sepals connate 1.5 mm into a transversely ovate lamina 2.5 mm long, 3 mm wide, the apices acute; petals orange to orange-brown, glabrous or microscopically cellular, transversely bilobed, 1.75 mm long, 3.25 mm wide, 4-veined, with a short tooth on the outer margin between the lobes, the upper lobe broadly elliptical to suborbicular, the lower lobe half as large, oblong, obtuse; lip rose to purple, the blades obovate, 2 mm long, agglutinated medially over the column, the apices broadly obtuse, the bases narrowly obtuse, the connectives short, cuneate, connate to the column above the base, the appendix in the acute sinus, pubescent, ligulate, nearly 1 mm long, convex, with a concave apical segment with a bilobulate apex; column 1.5 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Greek psyche, "a butterfly," in reference to the large petals.

Type: Panama: Prov. of Chiriqui: epiphytic in small trees near Volcan, "La Cordillera," alt. 1300 m, 9 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9317 (Holotype: SEL); same area, C. Luer et al. 9312 (SEL); between Concepcion and Volcan, alt. ca. 1000 m, 9 Sept. 1976, C. Luer & H. Butcher 1158 (SEL).

Vegetatively this species is very similar to that of L. setos. In mature plants, the thick, heavy, concave, coppery leaves cause the stems to bend or hang from their perch. The small flowers are distinguished by the large, overlapping petals with a small marginal tooth. The toothed petals and the agglutinated blades of the lip indicate some relationship with the South American L. mucronata Lindl.

Lepanthes schizocardia Luer, sp. nov.

Planta mediocris, foliis late ellipticis inflorescentia longioribus, racemo congesto disticho longipedicellato, sepalis ovatis, petalis transverse bilobis obtusis, labello cordato concavo apice acuto bifido, appendice crassa ligulata pubescenti, columna brevi.

Plant medium in size, epiphytic, caespitose; roots filamentous. Secondary stems slender, erect, 2.5-9.5 cm tall, enclosed by 5-9 close, dark brown, microscopically ciliate-scabrous lepanthiform sheaths. Leaf erect, coriaceous, suffused with purple beneath, broadly elliptical, 2.5-5 cm long, 1.2-3 cm wide, the apex subacute to obtuse, more or less lightly acuminate, the base cuneate to round, contracted into a petiole 3-4 mm long. Inflorescence a congested, distichous, successively flowered raceme, up to 5 mm long, borne behind the leaf by a filiform peduncle 15-25 mm long; floral bract muricate, 2 mm long; pedicel 3-4 mm long; ovary 2 mm long; sepals yellow, ovate, subacute, the dorsal sepal 3-3.75 mm long, 2-2.25 mm wide, connate to the lateral sepals for 0.5 mm, the lateral sepals oblique, 3-4 mm long, 1.5-2 mm wide, connate for 1 mm; petals orange, suffused with red, microscopically pubescent, transversely bilobed, 1-1.25 mm long, 3-3.75 mm wide, 3-veined, the lobes subequal, triangular with rounded apices; lip red, microscopically cellular-pubescent, cordate with the acute apex bifid, the blades with connectives semiovate, concave, 1.75-2.25 mm long, the apices acute, the bases rounded, to either side of the column, connate to the base of the column, the appendix thick, ligulate, pubescent, below the sinus; column 1 mm long, the anther and stigma apical.

Etymology: From the Greek schizo-, "split," and kardia, "heart," in reference to the cleft, heart-shaped labellum.

Type: Panama: Prov. of Panama: epiphytic in cloud forest, Cerro Jefe, alt. 900 m, 1 Dec. 1983, C. Luer, J. Luer, H. Butcher & A. Mauduro 9193 (Holotype: SEL); same area, 2 Mar. 1976, C. Luer, J. Luer, P. Taylor & H. Butcher 709 (SEL); Altos de Pacoro, alt. 650 m, 4 Mar. 1976, C. Luer, J. Luer, P. Taylor & R. L. Dressler 733 (SEL).

This handsome species is best distinguished by the concave, cordate lip cleft at the apex. The laminae are mere thickenings along the margins, the demarcations with the connectives obscure. The blades and exposed body of the lip embrace the sides and bottom of the short column. The thick, pubescent appendix protrudes from beneath the sinus and between the apices of the blades.

Lepanthes setos Luer, sp. nov.

Planta mediocris, foliis crassis ellipticis breviter acuminatis inflorescentia longioribus, racemo congesto disticho, sepalo dorsali synsepaloque late ovatis, petalis grandis, lobis triangularibus pubescentibus, labelli laminis ellipticis pubescentibus, appendice ligulata convexa cum parte apicali concava.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems slender, erect to horizontal or pendent, 2.5-8 cm long, enclosed by 4-6 close, minutely scabrous lepanthiform sheaths.

Leaf erect to drooping, thickly coriaceous, more or less concave, often coppery in color, more or less suffused with purple beneath, elliptical, 2.5-4.5 cm long, 1-2.7 cm wide, the apex shortly acuminate, acute, the base cuneate into a petiole 2-3 mm long. Inflorescence a congested, distichous raceme up to 8 mm long, borne on top of the leaf by a filiform peduncle 10-12 mm long; floral bract and pedicel each 1 mm long; ovary 2.5 mm long; sepals yellow to tan, the dorsal sepal broadly ovate, obtuse, 3 mm long, 2.25 mm wide, the lateral sepals connate 1.5 mm into a broadly ovate lamina 2.75 mm long, 2.75 mm wide, the apices acute; petals orange, long-ciliate and pubescent, transversely bilobed, 1.3 mm long, 4.25 mm wide, 3-veined, the lobes subequal, triangular, acute; lip bright rose to purple, the blades narrowly elliptical, 2.2 mm long, long-ciliate and pubescent, the ends narrowly rounded, the connectives short, broadly cuneate, connected to the column above the base, the appendix in the sinus, pubescent, ligulate, 0.6 mm long, convex, with a concave apical segment with a bilobulate apex; column 2 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Greek setos, "a moth," in reference to the large pubescent petals.

Type: Panama: Prov. of Chiriqui: epiphytifer in scrubby trees near Volcan, alt. 1350 m, 7 Dec. 1983, C. Luer, J. Luer & H. Butcher 9279 (Holotype: SEL); "La Cordillera" near Volcan, alt. 1300 m, 9 Dec. 1983, C. Luer, J. Luer, A. Maduro & H. Butcher 9311 (SEL); Rio Chiriqui west of Volcan, alt. 1500 m, 12 Sept. 1976, C. Luer & H. Butcher 1203 (SEL); dry creek bed, llanos del Volcan, alt. 1500 m, 14 Sept. 1976, C. Luer & H. Butcher 1224 (SEL).

This species is essentially indistinguishable from L. psyche with which it grows sympatrically. The sepals and appendix of the lip are also amazingly similar, but the lobes of the petals of L. setos are acute and long-pubescent without a lateral tooth, and the blades of the lip are also long-pubescent and not agglutinated over the column.

Lepanthes trichidion Luer, sp. nov.

Planta parva, caulibus multivaginatibus foliis ovatis acutis paulo longioribus, inflorescentia foliis longiore, racemo congesto disticho, sepalis anguste ovatis magnis, petalis parvis transverse oblongis, labelli laminis oblongis, connectivis brevibus late cuneatis, appendice filamentosa.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect to suberect, 2-4 cm long, enclosed by 8-10 lepanthiiform sheaths with ciliate, dilated ostia and ribs. Leaf erect, thinly coriaceous, ovate, narrowly acute, 20-35 mm long, 7-12 mm wide, the base round to cuneate, contracted into a petiole 1-1.5 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 23 mm long, borne by a filiform peduncle up to 25 mm long; floral bract 2 mm long; pedicel 2-2.5 mm long; ovary 1 mm long; sepals translucent rose, suffused and veined in brown, car-

inate, narrowly ovate, acute, the dorsal sepal 10.5 mm long, 3 mm wide, connate 0.75 mm to the lateral sepals, the lateral sepals 11 mm long, 5.5 mm wide, connate 4 mm; petals yellow-brown, cellular-pubescent, transversely obliquely oblong, 1 mm long, 2.25 mm wide, the upper lobe oblong with the apex rounded, the lower lobe a third as long, obtusely triangular; lip white, glabrous, at most cellular-pubescent, the blades more or less oblong-lunate, 2.25 mm long, the ends rounded, the connectives short, broadly cuneate from the length of the blades, connected to the base of the column, the appendix a microscopic filament in a narrowly acute sinus; column slender, 3 mm long, the anther and stigma apical.

Etymology: From the Greek trichidion, "a tiny hair," referring to the appendix.

Type: Panama: Prov. of Chiriqui: epiphytic in cloud forest above Guadalupe, alt. 2300 m, 8 Dec. 1983, C. Luer, J. Luer & A. Maduro 9307 (Holotype: SEL).

This small species is characterized by the relatively large flower borne in a long, congested, distichous raceme that exceeds the leaf in length. The petals are the same size as the lip. The appendix in the narrow sinus is reduced to a microscopic, cellular process.

Lepanthes versicolor Luer & Vásquez, sp. nov.

Planta mediocris vel grandis, caulibus secundariis longis gracilibus, folio elliptico breviter acuminato racemo congesto longiore, sepalis scuminatis, petalorum lobis triangularibus, labelli laminis pubescentibus ovatis, appendice grandi oblonga longipubescenti.

Plant medium in size to large, epiphytic, caespitose; roots numerous, filiform. Secondary stems slender, erect, 8-23 cm long, enclosed by 9-16 ciliate lepanthiform sheaths. Leaf erect, thinly coriaceous, elliptical, 5.5-8 cm long, 1.6-2.7 cm wide, the apex acute acuminate, the base obtuse, contracted into a petiole 3-4 mm long. Inflorescence a congested, successively flowered raceme up to 3 cm long, borne behind the leaf by a filiform peduncle up to 4 cm long; floral bract 1 mm long; pedicel 1.25 mm long; ovary 3 mm long; sepals translucent rose to yellow, glabrous, ovate, acuminate, acute, the dorsal sepal triangular-ovate, 7-12 mm long, 3-4.75 mm wide, connate to the lateral sepals for 1-2 mm, the lateral sepals oblique, connate 2-3.5 mm, 7-11.5 mm long, 4.75-7 mm wide together; petals yellow to orange, suffused with red to purple, pubescent, transversely bilobed, 1-1.75 mm long, 4-5.25 mm wide, the lobes subequal, obliquely triangular; lip purple, pubescent, the blades ovate with rounded ends, pubescent, 2.25 mm long, the connectives cuneate, the body attached to the end of the ovary with the column, the appendix oblong, 0.5 mm long, long-pubescent at the apex; column 2 mm long, the anther dorsal, the stigma ventral.

Etymology: From the Latin versicolor, "of various colors," referring to the variation of colors seen in the flowers.

Type: Bolivia: Cochabamba: Prov. of Chapare: epiphytic in cloud forest between Cochabamba and Villa Tunari, alt. 1850 m, 17 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9382 (Holotype: SEL).

Although locally abundant in one area of cloud forest, this species has not yet been found elsewhere. Two or three flowers mature simultaneously, and fruit is frequently formed. As commonly seen in other species, the colors of the flower parts are variable.

Lepanthes volsella Luer & Escobar, sp. nov.

Herba perparva, inflorescentia racemosa congesta foliis parvulis brevior, sepalis anguste ellipticis, petalis transverse oblongis, labello bilobo lobis falcatis, appendice minuta triangulari.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 15-27 mm long, enclosed by 4-6 minutely ciliate lepanthiiform sheaths. Leaf erect, coriaceous, suffused with purple beneath, elliptical, obtuse, 8-11 mm long, 6-8 mm wide, the base broadly cuneate into a petiole 1 mm long. Inflorescence a congested, distichous, successively flowered raceme up to 4 mm long, borne on top of the leaf by a filiform peduncle 3-4 mm long; floral bract 0.75 mm long; pedicel 1 mm long; ovary 1 mm long; sepals light green with 2 light red stripes, narrowly elliptical, subacute, the dorsal sepal 3 mm long, 1.25 mm wide, connate to the lateral sepals for 0.3 mm, the lateral sepals connate 1 mm, 2.75 mm long, 1.25 mm wide; petals yellow, suffused with purple, transversely oblong, 0.4 mm long, 1.5 mm wide, cellular-glandular, the upper lobe triangular-oblong, obtuse, the lower lobe oblong with the apex rounded, larger than the upper lobe; lip red-orange, glandular-cellular, bilobed, the lobes falcate, acute, 0.9 mm long, flanking the column, the bases cuneate into a narrow body, connate to the column above the base, the rounded sinus with a small, triangular appendix; column 1.2 mm long, the anther apical, the stigma ventral.

Etymology; From the Latin volsella, "pincers," in reference to the shape of the lip.

Type: Costa Rica: Prov. of Cartago: La Chonta, along the Pan American highway, alt. 2450 m, 6 Aug. 1983, R. Escobar 3157 (Holotype: SEL), C. Luer illustr. 9135.

This little species is characterized by the small elliptical leaves with a short, congested inflorescence. The sepals are narrowly elliptical, the petals are small and transversely oblong, and the lip is bilobed with the falcate lobes embracing the column.

Lepanthopsis acetabulum Luer, sp. nov.

Planta mediocris, inflorescentia folio crasso angustissime elliptico subaequilonga vel paulo longiore, racemo disticho densifloro, floribus parvis simultaneis, sepalis ovatis acuminatis, petalis obtusis, labello cordato cum cavitate rotundata basali.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 4-10 cm long, enclosed by 6-8 blackish, ciliate lepanthiiform sheaths. Leaf erect, thickly coriaceous, narrowly linear-elliptical, acute, 2.5-6 cm long, 0.3-0.7 cm wide, the base cuneate into the petiole 2-5 mm long. Inflorescence a suberect, dense, distichous, simultaneously flowered raceme up to 18 mm long, borne by a filiform peduncle 20-40 mm long; floral bract 0.5-1 mm long; pedicel 0.25 mm long; ovary 0.5 mm long; sepals dark purple, cellular ciliate, ovate, acute, acuminate, the dorsal sepal 3-4 mm long, 1.6 mm wide, the lateral sepals oblique, 3-4 mm long, 1 mm wide, connate 0.75 mm, the apices near and parallel; petals dark purple, cellular ciliate, elliptical, obtuse, 1 mm long, 0.75 mm wide; lip lighter purple, cellular pubescent, ovate-cordate, 2 mm long, 1.75 mm wide, the apex obtuse, the basal angles obtuse, flanking the column, the base of the disc with a circular cavity, probably a modified glenion; column hooded, 0.5 mm long and wide.

Etymology: From the Latin acetabulum, "a vinegar cup," hence the pelvic socket, referring to the resemblance of the cavity of the lip to the acetabulum of the pelvis.

Type: Ecuador: Prov. of Zamora-Chinchipe: Valladilid, alt. 1800 m, 3 Jan. 1983, S. Dalström 417 (Holotype: SEL), C. Luer illustr. 9166; Retorno, between Loja and Zamora, alt. ca. 2000 m, 15 Apr. 1980, D. D'Alessandro 94 (SEL). Peru: Dept. of Huanuco: between Tingo Maria and Pucallpa, March 1975, collected by Janet Kuhn, flowered in cultivation at J & L Orchids, Easton, CT, 12 Nov. 1977, C. Luer 2175 (SEL).

This species is similar to L. acuminata Ames, but the leaves of L. acetabulum are long and narrow, and the lip has a circular cavity at the base.

Lepanthopsis culiculosa Luer, sp. nov.

Planta parva, caulibus secundariis plus minusve proliferantibus, racemo stricto disticho dense multifloro foliis anguste ellipticis longiore, floribus minutis simultaneis, sepalis ovatis uninerviis, petalis obtusis, labello transverse cordato.

Plant small, epiphytic, ?caespitose, ?normally prolific; roots slender. Secondary stems slender, erect, 2 or more cm long, enclosed by 3 or more microciliate lepanthiiform sheaths, branching and rooting at the apex of an incomplete stem in the specimen at hand. Leaf erect, thickly coriaceous, narrowly elliptical, acute, 17-22 mm long, 5 mm wide, cuneate below into the petiole 2 mm long. Inflorescence an erect, straight, distichous, dense, simultaneously many-flowered raceme up to 38 mm long, borne by a filiform peduncle up to 20 mm long, the flowers minute, bright yellow; floral bract 1 mm long; pedicel 0.25 mm long; ovary 0.5 mm long; sepals glabrous, ovate, narrowly obtuse, 1-veined, the dorsal sepal 1.3 mm long, 0.8 mm wide, the lateral sepals 1.5 mm long, 0.6 mm wide, connate 0.5 mm; petals oblong, obtuse, 0.4 mm long, 0.15 mm wide; lip transverse-

ly ovate-cordate, 0.6 mm long, 0.8 mm wide, the apex obtuse to rounded, the basal angles obtuse, to either side of the column; column hooded, 0.5 mm long and wide.

Etymology: From the Latin culiculosus, "with gnats," referring to the numerous, minute flowers.

Type: Ecuador: Prov. of Napo: Cosanga, alt. 2000 m, 1983, A. Hirtz 978 (Holotype: SEL), C. Luer illustr. 9169; Prov. of Zamora-Chinchi: Vilcabamba, alt. 2100 m, D. D'Alessandro 102A (SEL).

This species seems similar to the Venezuelan L. stevermarkii Foldats, but the longer leaves and longer, straight, densely flowered racemes distinguish L. culiculosa. Both species have very small, 1-veined sepals. Lepanthopsis culiculosa is also similar to L. vinacea C. Schweinf., but the former has ecaudate sepals on an extremely reduced scale.

Masdevallia leucophaea Luer & Vásquez, sp. nov.

Planta mediocris, pedunculo unifloro gracili foliis anguste obovatis subaequilongo, sepalis glabris albis longicaudatis in cupulam brevem connatis, petalis oblongis cum carina longitudinali in dentem magnum supra basim connatis, labello ovato apice anguste obtuso recurvo.

Plant medium in size, epiphytic, caespitose; roots slender. Secondary stems blackish, slender, erect, 1-1.5 cm long, enclosed by 2-3 tubular sheaths. Leaf erect, coriaceous, 7-10.5 cm long, 1.4-1.6 cm wide, the blade narrowly obovate, subacute to obtuse, narrowly cuneate below into a slender petiole 2.5-3.5 cm long. Inflorescence a solitary flower borne by a slender, suberect peduncle 6-8 cm long, with a bract below the middle, from a node low on the secondary stem; floral bract 8 mm long; pedicel 13-16 mm long; ovary greenish brown, 5 mm long; sepals glabrous, dull white to gray-white, lightly dotted with purple externally, the dorsal sepal ovate, concave, carinate, 13 mm long, 8 mm wide, connate to the lateral sepals for 2 mm into a shallow, gaping cup, the acute apex acuminate into a slender, yellow-orange, upcurved tail 2.5-3 cm long, the lateral sepals ovate oblique, 12-16 mm long, 8 mm wide, the margins more or less reflexed, connate 3-4 mm, the acute apex acuminate into a slender yellow-orange tail ca. 2.5 cm long; petals white with minute purple dots along the upper margin, oblong, 6 mm long, 2 mm wide, the apex truncate, minutely apiculate, the lower margin with a longitudinal carina ending in a large, obtuse, incurved process above the base; lip white, speckled with purple, ovate, 4.5 mm long, 2.5 mm wide, the apex purple, narrowed with the obtuse tip recurved, the truncate base hinged beneath; column white with purple margins, semiterete, 4 mm long, the foot 3 mm long with a long, incurved extension.

Etymology: From the Latin leucophaeus, "light gray," referring to dull white color of the sepals.

Type: Bolivia: Prov. of Sud Yundas (probably): cultivated by Don Dino Menato in Chulumani, without definite locality, flowered in cultivation 24 Jan. 1984, C. Luer 9426 (Holotype: SEL).

This species has been cultivated by Dino Menato for many years. Its origin has been long forgotten, but it most probably was collected in the mountains of the Yungas surrounding Chulumani. At least two clones are cultivated by Menato. The lateral sepals of one clone are held close together with revolute margins. The lateral sepals of another clone are spread without revolute margins.

Masdevallia scopaea Luer & Vásquez, sp. nov.

Planta perparva, inflorescentia grandifloro successivifloro, pedunculo foliis anguste ellipticis plus minusve aequilongo, sepalis striatis ecaudatis in tubum latum cylindricum connatis, petalis oblongis acutis cum dente obtuso supra basim, labello elliptico obtuso canaliculato arcuato.

Plant very small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 2-3 mm long, enclosed by 2-3 short, tubular sheaths. Leaf erect, coriaceous, 15-23 mm long, 3.5-5 mm wide, the blade narrowly elliptical, acute, cuneate below into a petiole 1-2 mm long. Inflorescence a congested, few-flowered raceme of comparatively large, successive flowers, borne by a slender suberect to horizontal peduncle 2 cm long, with a bract below the middle, from a node on the secondary stem; floral bract 3 mm long; pedicel 2 mm long; ovary 1.5 mm long; sepals glabrous, yellow, veined in purple-brown, the dorsal sepal narrowly ovate, 13 mm long, 3.25 mm wide, connate 4 mm to the lateral sepals to form a short, broad, sepaline tube, the free portion linear-triangular, subacute, the lateral sepals suffused with purple, ovate, 12 mm long, 4 mm wide, connate for 4 mm with a small mentum below the column-foot, the free portion triangular, subacute; petals yellow with a purple midvein, oblong, acute, 4.5 mm long, 1.5 mm wide, the lower margin thickened with a rounded, retrorse process above the base; lip yellow, suffused with purple-brown, elliptical, arcuate, longitudinally channeled, 5.5 mm long, 2 mm wide, the apex obtuse with a low midline callus, the base narrowed, subcordate, hinged beneath; column yellow with purple margins, semiterete, 2.5 mm long, the foot equally long with an incurved extension.

Etymology: From the Greek skopaios, "dwarf," referring to the habit of the species.

Type: Bolivia: La Paz: Prov. of Nor Yungas: epiphytic in cloud forest west of Coroico, alt. 1800 m, 22 Jan. 1984, C. Luer, J. Luer & R. Vásquez 9425 (Holotype: SEL).

Only one plant of this tiny species was found by Roberto Vasquez among numerous plants of Masdevallia bangii Schltr. It is characterized by the successively flowered raceme a little longer than the leaves. The yellowish flowers veined in purple-brown are large for the size of the plant.

Platystele enervis Luer, sp. nov.

Planta pusilla, racemo flaccido flexuoso capillari folio longipetiolato multilongiore, floribus minutissimis successivis, sepalis ovatis enervibus, lateralibus obtusis brevicaudatis, petalis angustissimis, labello ovato acuto.

Plant very small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 6-8 mm long, enclosed by 2-3 ribbed, tubular sheaths. Leaf erect, coriaceous, elliptical, subacute, long-petiolate, 10-21 mm long including the 4-8 mm long petiole, 3-4 mm wide, cuneate below into the slender petiole. Inflorescence a weak, flexuous, loosely flowered raceme up to 7 cm long including the capillary peduncle 1.5-2 cm long, the flowers successive, minute; floral bract 0.5 mm long; pedicel 1 mm long; ovary 0.25 mm long; sepals purple, white toward the apices, glabrous, free, without visible nerves, the dorsal sepal ovate, acute, 0.8 mm long, 0.4 mm wide, the lateral sepals broadly ovate, obtuse, 0.6 mm long, 0.4 mm wide, the obtuse apex abruptly contracted into a short tail; petals very narrowly triangular, acute, 0.6 mm long, 0.1 mm wide; lip purple, cellular-pubescent, ovate, acute, 0.6 mm long, 0.4 mm wide; column thinly cucullate, 0.4 mm long, 0.4 mm wide.

Etymology: From the Latin enervis, "without a nerve," referring to the sepals and petals.

Type; Ecuador: Prov. of Pichincha: epiphytic in cloud forest near Los Faisanes, alt. ca. 2000 m, 15 July 1983, A. Hirtz 1009 (Holotype: SEL), C. Luer illustr. 9164.

This species is most notable for the extremely small flowers produced on a hairlike, flexuous raceme much longer than the long-petiolate leaves. The sepals and petals are less than one millimeter long and without any trace of a midvein.

Platystele pubescens Luer, sp. nov.

Planta pusilla, racemo flexuoso folio longipetiolato duplolongiore, sepalis ovatis acutis ciliatis pubescentibus, petalis obovatis acutis ciliatis, labello transverse ovato obtuso.

Plant very small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 2-4 mm long, concealed by 2-3 loose, tubular sheaths. Leaf erect, coriaceous, elliptical, subacute, long-petiolate, 13-20 mm long including the 4-10 mm long petiole, 4-7 mm wide, cuneate below into the slender petiole. Inflorescence a loose, flexuous, successively flowered raceme up to 35 mm long including the capillary peduncle 15-20 mm long; floral bract 1 mm long; pedicel 2.5-3 mm long; ovary 0.5 mm long; sepals yellow with a red midvein, ciliate, pubescent above the middle, ovate, acute, 1-veined, free, the dorsal sepal 2.3 mm long, 1.5 mm wide, the lateral sepals oblique, 2 mm long, 1.2 mm wide; petals yellow with a red midvein, obovate, acute, ciliate, 2.3 mm long, 0.7 mm wide; lip red, cellular-pubescent, transversely ovate, obtuse, 0.8 mm long, 1 mm wide; column thinly cucullate, ca. 1 mm long and wide.

Etymology: From the Latin pubescens, "pubescent," referring to the pubescent sepals.

Type: Ecuador: Prov. of Pichincha: epiphytic in cloud forest near San Miguel de los Bancos, alt. 1300 m, July 1983, A. Hirtz 1044 (Holotype: SEL), C. Luer illustr. 9163.

Although similar in many respects to those species in the widespread and variable "lancilabris-complex," this species may be distinguished by the pubescent sepals and transversely ovate, obtuse lip.

Pleurothallis corynophora Luer, sp. nov.

Planta parva caespitosa, racemo laxo fractiflexo foliis anguste obovatis multilongiore, sepalis ellipticis intus pubescentibus, petalis clavatis apice pubescentibus, labello oblongo ciliato canaliculato.

Plant small, epiphytic, caespitose; roots slender. Secondary stems slender, erect, 3-5 mm long, enclosed by 2-3 ribbed, tubular sheaths. Leaf erect, coriaceous, narrowly obovate, subacute, long-petiolate, 20-27 mm long including the 5-10 mm long petiole, 4-5 mm wide. Inflorescence a progressively lengthening loose, flexuous, flexible, successively many-flowered raceme up to 8 cm long including the 2-3 cm long peduncle; floral bract 2 mm long; pedicel 1.5-2 mm long; ovary triquetrous, 1 mm long; sepals rose-brown, long-pubescent within, the dorsal sepal narrowly ovate-elliptical, 6 mm long, 2 mm wide, the lateral sepals connate into an elliptical lamina 5.5 mm long, 3 mm wide, the apex shortly bifid, the apices subacute; petals rose-brown, 4.5 mm long, 1.4 mm wide across the basal, ovate portion, narrowed above the middle, the apex thickened and pubescent; lip dark brown, oblong, 2 mm long, 1 mm wide, the apex rounded with revolute, ciliate margins, the margins thin and erect below the middle, the base truncate, bilobulate, thinly hinged to the column-foot, the disc longitudinally channeled; column semiterete, 2 mm long, toothed at the apex, the foot stout, short.

Etymology: From the Greek coryne, "a mace," and phoros, "bearing," in allusion to the clavate, bristly petals.

Type: Panama: Prov. of Chiriqui: epiphytic in cloud forest above Guadalupe, alt. 2300 m, 8 Dec. 1983, C. Luer, J. Luer & A. Maduro 9299 (Holotype: SEL).

This species seems most closely allied to the Costa Rican P. casualis Ames, but P. corynetes may be identified by the long racemes, clavate petals, and a ciliate lip.

Pleurothallis lipothrix Luer, sp. nov.

Species haec P. setigerae Lindl. affinis, sed sepalorum marginibus carinisque irregulariter denticulatis et labello late oblongo truncato convexo glabro marginibus integris distinguitur.

Plant small, epiphytic, densely caespitose; roots slender. Secondary stems slender, erect, 2-3 mm long, enclosed by 2-3 tubular sheaths. Leaf erect, coriaceous, obovate, subacute, long-petiolate, 15-30 mm long including the 7-14 mm long petiole, 4-6 mm wide. Inflorescence a loose, subflexuous, successively few-flowered raceme 5-12 cm long including the filiform peduncle; floral bract 1 mm long; pedicel 4-9 mm long; ovary 1 mm long; sepals light green, ovate basally, the apex acute, long-attenuate, the margins and carinae irregularly denticulate, 7.5 mm long, the dorsal sepal 1.5 mm wide, the lateral sepals 1.8 mm wide; petals translucent light green, 4.5 mm long, the basal third ovate, 1 mm wide, ciliate, the apex acute, long-attenuate; lip green, suffused with dull red, broadly oblong, 2.6 mm long, 1.5 mm wide, the margins entire, the apex truncate, the base subcordate with erect, obtuse, marginal angles, the disc longitudinally channelled below the middle, convex above the middle; column semiterete, 2 mm long, bidentate at the apex, column-foot short, thick, with 2 red spots at the base.

Etymology: From the Greek lipothrix, "hairless," referring to the short, convex lip.

Type: Ecuador: Prov. of Zamora-Chinchipec: collected by D. D'Alessandro near Km 41 between Loja and Zamora, alt. ca. 1400 m, cultivated at Vilcabamba, flowered 2 Nov. 1982, C. Luer 8267 (Holotype: SEL).

This species is related to the widespread P. setigera-complex, but may be distinguished by the irregularly denticulate sepals and the short, broad, truncate lip with entire margins, channelled below the middle and concave above the middle.

Pleurothallis simulatrix Luer, sp. nov.

Species haec P. aristatae Hook. similis, sed labello oblongo glabro ciliato infra medium bilobulato, lobis acutis brevibus, disco infra medium canaliculato differt.

Plant small, epiphytic, caespitose; roots coarse. Secondary stems slender, erect, 4-6 mm long, enclosed by 2-3 tubular sheaths. Leaf erect, coriaceous, obovate, subacute to obtuse, 2.5-4 cm long, 0.7-1 cm wide, cuneate below into a petiole 5-10 mm long. Inflorescence a lax, subflexuous, successively few-flowered raceme up to 6 cm long; floral bract 1 mm long; pedicel 2-3 mm long; ovary 0.75 mm long; sepals translucent light green, striped with purple, glabrous, the dorsal sepal narrowly ovate, the apex acute, acuminate, 6 mm long, 1.75 mm wide, the lateral sepals narrowly triangular, the apex acute, 5.5 mm long, 1.75 mm wide, connate 0.5 mm; petals translucent with 2 purple veins, elliptical, acute, 2.5 mm long, 0.75 mm wide, the margins serrate; lip purple, oblong, 3 mm long, 1 mm wide, smooth, the apex rounded, white-ciliate above the middle, with a pair of small, acute, erect lobes just below the middle, the base truncate, the disc channelled below the middle; column light green, semiterete, 2.5 mm long, narrowly winged, the foot short with a purple spot, the anther acutely conical.

Etymology; From the Latin simulatrix, "an imitator," referring to the similarity in appearance to P. aristata.

Type: Ecuador: without locality, probably southern Ecuador, cultivated at Predesur in Vilcabamba, flowered 3 Nov. 1982, C. Luer 8268 (Holotype: SEL).

Although larger in habit, this species is similar to P. aristata but differs mainly in the morphology of the lip. The lip of P. simulatrix is oblong, smooth, ciliate, with a pair of short, lateral lobes.

Pleurothallis yupanki Luer & Vásquez, sp. nov.

Planta minuta repens, flore subsphaeruco brevipedicellato foliis ellipticos prostratos subaequant, sepalis obtusis semiconnatis concavis, petalis oblongis obtusis, labello ligulato lobis lateralibus parvis acutis.

Plant minute, lithophytic, repent, the rhizome stout, 1 mm thick, up to 0.5 mm long between secondary stems; roots comparatively coarse, 1-1.5 mm thick. Secondary stems stout, up to 0.5 mm long, enclosed by a deciduous, membranous sheath. Leaf prostrate, thickly coriaceous, elliptical, 4-5 mm long, 2.5-3 mm wide, 1-1.5 mm thick, the apex obtuse to rounded, minutely apiculate, the base obtusely cuneate, sessile. Inflorescence a single flower, followed at intervals by 1-2 others in a congested raceme, the peduncle 0.5 mm long; floral bract 1-1.5 mm long; pedicel 1 mm long; ovary 0.5 mm long; sepals dark purple, glabrous, connate for more than half the lengths into a subspherical sepaline tube, the dorsal sepal elliptical, obtuse, concave, 4 mm long, 2.5 mm wide unexpanded; lateral sepals elliptical, obtuse, connate into a concave lamina, 3.5 mm long, 2.75 mm wide unexpanded; petals purple, obovate, oblong, obtuse, 2 mm long, 1.25 mm wide; lip purple, oblong-ligulate, 2 mm long, 0.8 mm wide, smooth, the apex round, the margins with erect, acute, lateral lobes below the middle, the truncate base bilobulate, hinged to the column-foot; column semiterete, bidentate, 1.5 mm long, the foot 0.75 mm long.

Etymology: Named in honor of the chieftain Inca Yupanki who built the stone buildings now lying in ruins east of Samaipata.

Type: Bolivia: Dept. of Santa Cruz: lithophytic on stone Inca ruins east of Samaipata, alt. 2500 m, Nov. 1982, R. Vásquez & N. Williams s.n. (Holotype: SEL), C. Luer illustr. 8524.

This minute, creeping, prostrate species produces flowers as large as the confetti-sized leaves. The sepals are connate over half their length into a suborbicular flower.

THREE NEW SPECIES OF HETEROTHECA (ASTERACEAE-ASTEREAE)

FROM NORTHERN MEXICO

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Abstract

Three new species of Heterotheca from northern Mexico have been described. Two of these, H. mucronata and H. gypsophila, occur in northeastern Mexico in the regions south of Monterrey and Saltillo. The other species, H. mexicana, is known from a relatively small area some 30 miles west of Ciudad Durango.

The several novelties described below have been under surveillance for over 20 years now and, because of impending floristic treatments in the region concerned, it seems appropriate to make formal their baptism. Two of the taxa, H. mexicana and H. mucronata, have received manuscript names by V. L. Harms (by annotation in 1963) and I have selected sheets examined by him to typify these. Sheets of H. gypsophila were apparently not examined by Harms, most of the specimens having accrued in herbaria since his early studies. Recent exploration of the gypsum outcrops about Cerro Potosi has shown the taxon to be fairly common and readily distinguished from H. mucronata, its closest ally.

I am grateful to my colleague, Dr. M. C. Johnston, for the Latin diagnoses and to Dr. James Henrickson for helpful discussion concerning the several taxa concerned.

Heterotheca mexicana Harms

H. mucronata accedens sed pedunculis longioribus, floribus radiatis paucioribus fimbria squamosa pappi exteriori nulla.

Ascending-erect perennial from stout woody tap-roots, the stems several, procumbent and arising from its crown. Leaves oblanceolate to spatulate, 10-30 mm long, 3-7 mm wide, sessile or with petioles 1-4 mm long, obtuse or rounded at the apex, strigose-sericeous on both surfaces. Heads broadly turbinate to hemispheric borne on elongate, often bracteate, peduncles (2)4-9 cm long. Receptacle 3-4 mm across, somewhat alveolate. Involucre 4-5 seriate, imbricate, 8-10 mm high, about as wide; bracts linear-lanceolate, 3-10 mm long, 0.3-2.0 mm wide, moderately appressed pubescent, the margins ciliate, often scarious and tinged with purple. Ray florets 13-21; ligules yellow, 11-17 mm long, 2-4 mm wide; tube ca. 5 mm long, glabrous. Disk florets numerous, yellow, glabrous, tubular, 6.0-7.5 mm long. Achenes 2.5-3.0 mm long, densely appressed sericeous; pappus of ca. 50

off-white, ciliate, bristles, 5-8 mm long, an outer scaly series absent.

TYPE. MEXICO. Durango: Fields along route 40, ca. 31 mi SW of Durango, 16 Aug 1960, King 378 (holotype TEX).

Additional Specimens Examined. Durango: 30 mi W of Durango, 28 Sep 1962, Cronquist 9546 (TEX); 30 mi SW Durango, 8 Sep 1965, Jackson 7194 (TEX); 7.2 km E of turnoff to El Pino on Highway 40, 24 Aug 1979, Lane 2720 (LL).

A strikingly distinct species with its long-pedunculate heads and pappus which lacks an outer series of scales. It is known only from open pine-oak woodlands about 30 miles southwest of Ciudad Durango.

Heterotheca mucronata Harms, sp. nov.

H. mexicana accedens sed pedunculis brevioribus, floribus radiatis multioribus, squamis pappi exteriore bene evolutis.

Erect or procumbent perennial from slender rhizomes, 10-25 cm high. Stem reddish, covered with a mixed, appressed to spreading, white, soft pubescence, the hairs 0.5-2.5 mm long. Leaves obovate to spatulate, 1.5-5.0 cm long, 0.6-1.4 cm wide, obtuse to rounded at the apex, except for the minute mucro, the upper leaves sessile, the lower leaves with petioles 10-25 mm long, softly white appressed sericeous on both surfaces. Heads few, terminal or axillary on peduncles mostly 1-3 cm long. Involucre hemispheric, 4-5 seriate, imbricate, 9-10 mm high, up to 20 mm across when pressed; bracts narrowly lanceolate, pubescent throughout with long, appressed to spreading white, soft trichomes, those of the inner series with scarious margins and often tinged with purple. Receptacle convex, 5-7 mm across, somewhat alveolate. Ray florets 21-34, pistillate and fertile; ligules yellow, 8-10 mm long. 1.5-2.5 mm wide; tube 4-5 mm long, sparsely pubescent. Disk florets numerous, yellow; corollas tubular, 5-6 mm long, glabrous or nearly so. Achenes 1.5-2.0 mm long, appressed pubescent; pappus biseriate, the outer of 20-30 slender scales ca. 1 mm long, the inner of ca. 35, tawny or reddish, ciliate bristles 5-6 mm long. Chromosome number $2n = 18$ pairs.

TYPE: MEXICO. Nuevo Leon: Puerto de Santa Ana, ca. 15 mi SW Galeana, "common on an unwooded slope". 28 Jun 1934, C. H. & M. T. Mueller 934 (holotype TEX; isotype AA).

Additional Specimens Examined: COAHUILA: ca. 6 mi E Jaime, 25°21' N x 100°32' W, 15 May 1977, Henrickson et al. 16137 (TEX). NUEVO LEON: 8.5 mi below Iturbide, 24°45' N x 100°46', 27 Oct 1982, Grimes et al. 2340 (TEX); Sierra La Marta, 3360 m, 5 Jul

1981, Hinton et al. 18307 (TEX); Santa Rosa Canyon, W of Linares, 22 Apr 1946, M. C. Johnston s.n. (TEX); 25 m W of Linares, 8 Sep 1962, Turner & Powell 1058 (TEX); 30 km E Doctor Arroyo, Jul 1977, Wells & Nesom 389 (LL); 22 mi W of Linares, 16 Mar 1976, Whalen 316, 318 (LL). TAMAULIPAS: ca. San Jose, 4600 ft, Sierra de San Carlos, 19 Jul 1930, Bartlett 10492 (LL). ZACATECAS: Sierra Astillero, ca. 24°34' x 101°04', 2 Jul 1973, Johnston et al. 11571 (TEX).

As noted above, Heterotheca mucronata occurs over a relatively broad region of pine-oak forests from 1500 to 3400 meters elevation. I have observed it repeatedly on limestone bluffs and ledges on the main road between Linares and Roberto Junction where it is especially abundant about the engraved highway mural 25 miles west of Linares. So far as known, it does not occur with H. gypsophila, preferring rocky or relatively shallow calcareous soils. No doubt the two taxa are closely related and a more conservative rendering might treat them as conspecific; I prefer to emphasize the edaphic differences and the fact that the several morphological characters which mark H. gypsophila are consistently correlated with gypseous outcrops.

Heterotheca gypsophila B. L. Turner, sp. nov.

A H. mexicana pubescentibus uniformibus leucosericeis, foliis parvioribus crassioribus, floribus radiatis paucioribus, pappo minus fulvo, distributione solo gypseo restricta differt.

Erect rhizomatous perennial, 10-23 cm high. Stems several from the base, erect to procumbent, silvery-white pubescent. Leaves oblanceolate to spatulate, 1-3 cm long, 0.4-0.9 cm wide, shortly apiculate at the apex. Heads usually 1-4, borne terminal on peduncles 1-5 cm long (occasionally axillary and up to 7 cm long from lower leaves). Involucre broadly turbinate to campanulate, 8-10 mm high, 10-15 mm wide (when pressed); bracts 3-4 seriate, imbricate, linear-subulate, 3-10 mm long, ca. 0.7 mm wide, densely pubescent with appressed white hairs. Ray florets fertile, yellow, 13-21; ligules 10-14 mm long, 1.5-2.0 mm wide; tube ca. 5 mm long, glabrous. Disk florets numerous, 5-lobed, tubular, glabrous, 5-6 mm long, ca. 0.5 mm wide, the tube ca. 2 mm long, the limb 3-4 mm long. Achenes ca. 2.5 mm long, white sericeous throughout; pappus double, the outer series of slender scales, 0.5-1.0 mm long, the inner series of numerous slender somewhat tawny bristles 6-7 mm long.

Holotype: MEXICO. Nuevo Leon: "On bank of gypsum arroyo in pinyon forest 4 miles north of Pablillo", 21 Jul 1958, D. S. Correll & I. M. Johnston 19919 (LL).

Additional collections examined: NUEVO LEON. Municipality Galeana: El Carrizo, 27 Jun 1983, Hinton et al. 18471 (TEX);

Pablillo, 28 Jun 1983, Hinton et al. 18476 (TEX); 5 km S Pablillo, 18 Oct 1983, Hinton et al. 18634 (TEX); Pablillo, S of Pablillo, 26 Jun 1934, Pennell 16975 (US).

So far as known Heterotheca gypsophila is confined to gypsum outcrops. However, it is clearly related to the surrounding calciphile, H. mucronata, and probably was selected out of that populational matrix in relatively recent times. A more conservative treatment might treat these two taxa as but varietally distinct, much as I accorded a similar taxon-pair from this same region, Helianthella mexicana var mexicana and H. m. var gypsophila. (Turner, 1977). In the latter pair, however, intermediates, and presumably gene flow, occur between the taxa, hence the varietal disposition. No such intermediates are known between H. mucronata and H. gypsophila and, combined with the constant morphology for the five or more separate collections assembled to date, suggest that specific treatment is appropriate.

Literature Cited

Turner, B. L. 1977. A gypsophilic species of Helianthella (Asteraceae-Heliantheae) from northwestern Mexico. Southwestern Naturalist 22: 553-554.

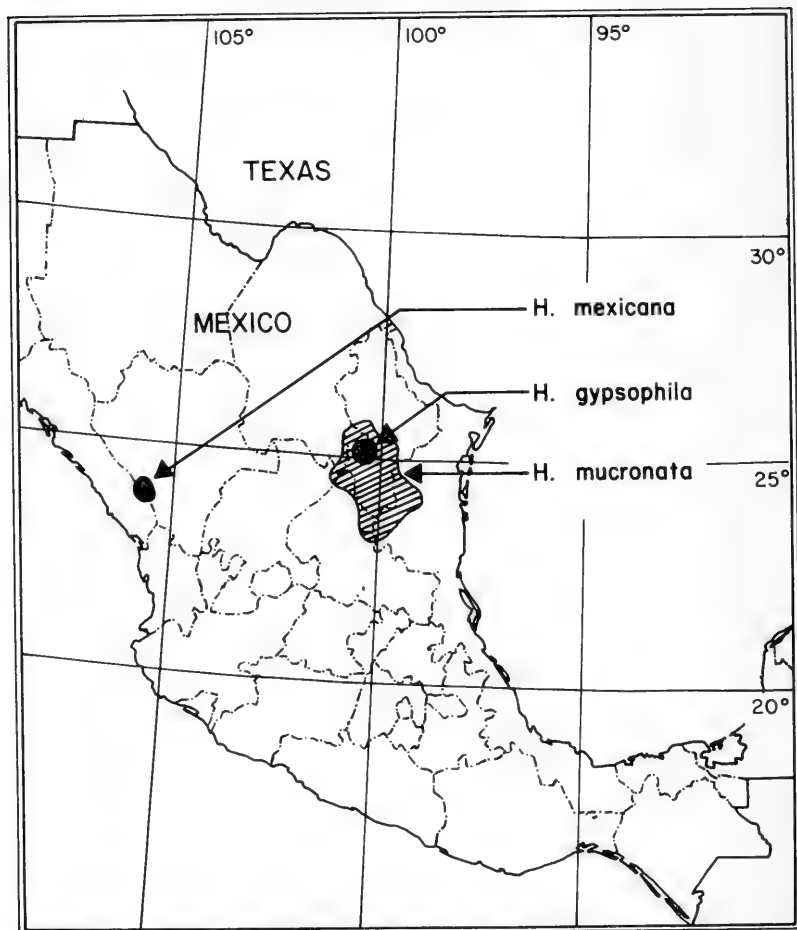


Fig. 1. Distribution of Heterotheca species.

NOMENCLATORIAL CHANGES INVOLVING WYOMING GRASSES

Alan A. Beetle, APDO Postal, Hermosillo, Sonora,
Mexico

Grasses of Wyoming has been through two editions, the first by A.A. Beetle and Morton May (1971. Wyoming Agric. Exp. Sta. Res. J. 39: 1-151), the second by A.A. Beetle (1977. Wyoming Agric. Exp. Sta. Res. J. 39R: 1-154). A third edition is now in progress to be authored by A.A. Beetle, Quentin Skinner and Gregory P. Hallsten. During the preparation of this third edition there appeared a need for a few changes in the nomenclature.

Bromus marginatus Nees is a mountain grass occurring commonly in the higher areas of the West. Its distribution contrasts sharply with that of Bromus carinatus Hook. & Arn. with which it has frequently been confused, but which occurs from Oregon south to Mexico mostly at low elevations.

Among the many variations that have been described in this complex there is one which seems to be most closely related to Bromus marginatus and should be treated as follows:

Bromus marginatus Nees var. breviaristatus
(Buckl.) Beetle, comb. nov. (Based
on Bromus breviaristatus Buckl.,
Proc. Acad. Phila. 1862: 98. 1862.)

This grass, described from the "Rocky Mountains" where collected by Nuttall, differs sharply in its narrow blades and canescent to densely retrorse-pilose sheaths.

Elymus trachycaulus (Link) Gould ex Shinners var. latiglume (Scribn. & Smith) Beetle, comb. nov.

Agropyron violaceum (Hornem.) Lange var.
latiglume Scribn. & Smith, U.S. Dept. Agr.,
Div. Agrost. Bul. 4,30. 1897.

Agropyron latiglume (Scribn. & Smith) Rydb.,
Torrey Bot. Club Bul. 36:539. 1909.

Agropyron caninum (L.) Beauv. var. latiglume
Pease & Moore, Rhodora 12:73. 1910.

Agropyron trachycaulum (Link) Malte var. latiglume (Scribn. & Smith) Beetle, Rhodora 54:196. 1952.

This variety differs from the species in having a shorter spike, closely imbricate spikelets and pubescent lemmas. It is an arctic entity extending into the northern and central Rocky Mountains in the alpine and subalpine zones.

Elymus trachycaulus (Link) Gould ex Shinners var. majus (Vasey) Beetle, comb. nov.

Agropyron violaceum (Hornem.) Lange var. major Vasey, U.S. Natl. Herb. Contrib. 1:280. 1893.

Agropyron trachycaulum (Link) Malte var. majus (Vasey) Fernald, Rhodora 35:171. 1933.

The spike is shorter and broader than that of the species and the spikelets, at least the upper ones, are closely imbricate.

Elymus trachycaulus (Link) Gould ex Shinners var. unilaterale (Cassidy) Beetle, comb. nov.

Agropyron unilaterale Cassidy, Colo. Agr. Expt. Sta. Bul. 12:63. 1890.

Agropyron trachycaulum (Link) Malte var. unilaterale Malte, Canada Natl. Mus. Ann. Rpt. 1930 (Bul. 68):46. 1932.

The lemmas of this variety have awns 17-40 mm long.

Elymus trachycaulus (Link) Gould ex Shinners var. unilaterale f. andinum (Scribn. & Smith) Beetle, comb. nov.

Agropyron violaceum (Hornem.) Lange var. andinum Scribn. & Smith, U.S. Dept. Agr., Div. Agrost. Bul. 4:30. 1897.

Agropyron subsecundum (Link) Hitchc. var. andinum (Scribn. & Smith) Hitchc., Amer. Jour. Bot. 21:132. 1934.

Agropyron trachycaulum (Link) Malte var. unilaterale Malte f. andinum (Scribn. & Smith) Beetle Rhodora 54:196. 1952.

This form of var. unilaterale is found at or near tree line in the montane zone of the western states and has divergent awns and basally geniculate culms.

Elytrigia repens (L.) Desv. ex Jacks. f. aristatum (Schum.) Beetle, comb. nov.

Triticum repens L. var. aristatum Schum., Enum. Pl. Partibus Saellandiae Sept. & Orient. 1:38. 1801.

Agropyron repens (L.) Beauv. f. aristatum (Schum.) Holmb., Skand. Fl. 2:274. 1926.

This is a long-awned form of E. repens, native to Eurasia and widespread in North America as a weed on moist disturbed sites.

Elytrigia riparia (Scribn. & Smith) Beetle, comb. nov.

Agropyron riparium Scribn. & Smith, U.S. Dept. Agr., Div. Agrost. Bul. 4:35. 1897.

Elytrigia riparia is similar to E. dasystachya, differing in its narrower leaves and usually glabrous lemmas, and in its more mesic habitat. It occurs through much of the northern and western parts of the distribution of the latter species.

Elytrigia smithii (Rydb.) Nevski var. molle (Scribn. & Smith) Beetle, comb. nov.

Agropyron spicatum (Pursh) Scribn. & Smith var. molle Scribn. & Smith, U.S. Dept. Agr., Div. Agrost. Bul. 4:33. 1897.

Agropyron smithii Rydb. var. molle (Scribn. & Smith) M.E. Jones, West. Bot. Contrib. 14:18. 1912.

The variety occupies much of the same range as the species and differs in having variously pubescent lemmas.

Elytrigia vaillantianum (Wulf. & Schreb.) Beetle, comb. nov.

Agropyron vaillantianum (Wulf. & Schreb.) ex Besser., Enum. Pl. 41. 1822, nomen; (Wulf. & Schreb.) Trautv., Act. Hort. Petrop. 9:329. 1884.

Triticum vaillantianum Wulfen & Schreber, ap.
Schweiger et Koerte, *Florae Erlangensis* 1:143.
1811.

Elytrigia repens (L.) Desv. ex Jacks. var.
vaillantianum (Wulf. & Schreb.) Prokudin, Proc.
Bot. Inst. Kharkov. 3:189. 1938.

A more complete synonymy is given elsewhere by Beetle
(1981. *Phytologia* 49:33-35). Elytrigia vaillantianum
closely resembles E. repens and has been reported for
Europe, North America and Argentina.

Leymus simplex (Scribn. & Williams) D.R.Dewey var.
luxurians (Scribn. & Williams) Beetle, comb. nov.

Elymus simplex Scribn. & Williams var. luxur-
ians Scribn. & Williams, U.S. Dept. Agr., Div.
Agrost. Bul. 11:58. 1898.

This is an awned variety apparently only known from sandy
areas in Sweetwater County, Wyoming.

The following taxa have been relegated to the genus
Elytrigia Desv. by Dewey (1983. New nomenclatural combin-
ations in the North American perennial Triticeae (Gramin-
eae)). While closely related to Elytrigia, these taxa
separate well from the North American members of that gen-
us in being caespitose or weakly rhizomatous and general-
ly possessing long divergent awns. It seems proper on
the basis of morphology to place these entities in the
genus Roegneria C. Koch (type: R. caucasica C. Koch).

Roegneria albicans (Scribn. & Smith) Beetle, comb. nov.

Agropyron albicans Scribn. & Smith, U.S. Dept.
Agr., Div. Agrost. Bul. 4:32. 1897.

This species is found on dry shrub and grasslands on the
plains, foothills and lower mountains of the northern and
central Rocky Mountain states and into Canada.

Roegneria albicans var. griffithsii (Scribn. & Smith)
Beetle, comb. nov.

Agropyron griffithsi Scribn. & Smith ex Piper,
Biol. Soc. Wash. Proc. 18:148. 1905.

Agropyron albicans Scribn. & Smith var. grif-
fithsii (Scribn. & Smith) Beetle, *Rhodora* 54:
196. 1952.

The variety differs from the species in having broader blades and glabrous lemmas. The distribution and habitat are similar to those of the species.

Roegneria spicata (Pursh) Beetle, comb. nov.

Festuca spicata Pursh, Fl. Amer. Sept. 1:83.
1814.

Agropyron spicatum (Pursh) Scribn. & Smith, U.S.
Dept. Agr., Div. Agrost. Bul. 4:33. 1897.

Roegneria spicata is found in dry situations from basins to the montane zone in the western United States and Canada, and into Alaska.

Roegneria spicata f. inerme (Scribn. & Smith) Beetle,
comb. nov.

Agropyron divergens Vasey var. inerme Scribn. &
Smith, U.S. Dept. Agr., Div. Agrost. Bul. 4:27.
1897.

Agropyron spicatum inerme Heller, N. Amer. Pl.
Cat. ed. 2. 3. 1900.

Agropyron inerme (Scribn. & Smith) Rydb., Torrey Bot. Club Bul. 36:539. 1909.

Agropyron spicatum (Pursh) Scribn. & Smith f. inerme (Scribn. & Smith) Beetle, Leafl. W. Bot. 6:162. 1951.

The form is awnless. It occupies habitats similar to those of the species and the two are often found together. The distribution is less extensive, apparently not ranging as far north or south.

BOOK REVIEWS

Alma L. Moldenke

"THE MERCK INDEX - An Encyclopedia of Chemicals, Drugs, and Biologicals Tenth Edition" edited by Martha Windholz & staff, xv, 1463, 100, 92, 76, 315, & 3 pp., Merck & Company Inc., Rahway, New Jersey 07065. 1983. \$28.50

The previous editions have appeared at approximately eight year intervals since 1889 and have been the most important and most wide-spread worldwide source of cross-indexed chemical and biomedical information ever since then. This is increasingly true of this new thick edition of more than 10,000 monographs of which half is new material which is followed by an updated organic name reaction section, an alphabetical list of tables from all chemical symbols used in biology and botany through WHD-abbreviated terms for radicals, a formula index, a cross-index of names, titles of deleted ninth edition monographs, an appendix, and some pages set aside for user notes. This "Merck Index has been broadened in scope to incorporate more information on biochemistry, pharmacology, toxicology and metabolism and to treat a range of topics related to agriculture and the environment." The print is clear, the paper thin, the thumb-indexed edging useful and the whole production available at an unbelievably low price.

"ANNUAL REVIEW OF PHYTOPATHOLOGY Volume 21, 1983" edited by R. G. Grogan, G. A. Zentmeyer & E. B. Cowling, ix & 429 pp., 29 b/w tab., 5 fig. & 5 photo. Annual Reviews Inc., Palo Alto, California 94309. 1983. \$27.00 U.S.A. or \$30.00 elsewhere.

As usual, the prefatory chapter provides an interestingly personalized professional lifetime report of a leader. Prof. Kohei Tomiyama of Hokkaido University and Experiment Station discusses his "Research on the Hypersensitive Response". He concludes with a translation from his Japanese text on the "Physiology of Plant Infection": "During the process of evolution, pathogens acquired the ability to break through innumerable obstacles in order to invade into and live upon a host plant.....Both the plants and parasites now surviving have developed various means for attack or defense against each other.....Pathogens continue to devise new armaments by mutations and selection." There are three other papers from Japan on Pathology of the Pine Wilt Disease, Host-Specific Toxins and Chemical Structures from *Alternaria* Species, and Induction of Resistance or Susceptibility. The two papers on historical perspectives are interesting reports on F. D. Heald and on Erwin Frink Smith. There are 14 other fine papers in this volume.

"McGraw-Hill Dictionary of Scientific and Technical Terms Third Edition" by Sylvia P. Parker, editor-in-chief, & staff, xv, 1781 & appendix 65 pp., 3,000+ b/w diag., graphs, draw. & photo. McGraw-Hill Book Co., New York, N. Y. 10020. 1984. \$70.00.

In this excellent, helpful production more than 115,500 definitions (ca. 7,500 new) from over 100 disciplines of all sciences, technologies, engineering, electronics and computerization are defined succinctly and clearly after careful checking. In the 2-inch outer margins are the many (ca. 3,000) illustrations rendered larger than in many cramped detailed dictionaries. There is considerable cross-referencing. Different definitions and spellings are given where needed. The appendix carries several important listings such as conversion factors for the measurement of systems, semi-conductor symbols, taxonomic classification of organisms. With English ever increasing in use as the international scientific and technical language of the world, this publication should have world-wide usefulness. The price is reasonable considering size. It should be regarded as a very important scientific, technical and educational aid for high schools through universities, research institutions, laboratories, and public as well as personal libraries of science writers.

"DOUBLE FLOWERS - A Scientific Study" by Joan Reynolds & John Tampion, 183 pp., 20 b/w photos, 26 fig. & 13 tab. Scientific and Academic Editions, New York, N. Y. 10020. 1983. \$22.50.

"The theories surrounding the double condition have attracted workers in anatomy and genetics, floral morphology and physiology, [horticulture], and in every field the state of doubleness is equally provocative of new ideas." Polypetalous families such as the *Ranunculaceae*, *Papaveraceae*, *Rosaceae* and *Caryophyllaceae* produce more doubling than the sympetalous such as *Primulaceae*, *Oleaceae* and *Campanulaceae* with their fimbriated petals, hose-in-hose arrangements and some petaloid development of stamens. The photographs in this book are very helpfully clear. In years past I found in many thousand double *Saponaria officinalis* flowers with both staminoid petals & petaloid stamens, both with all grades from abortive through fertile anther sacs and filaments. In only some of these did vascular supply indicate origin. In this species I found two types of "doubling": (a) just a few extra rows of petal-appearing structures with complete or incomplete anthers or staminoid structures and (b) extra stamen/petals (often to a hundred count), even pistil and rarely calyx abnormalities. The former (a) still looked "neat" and have been found growing in old kept or abandoned gardens occasionally along with the single-flowered bouncing-bet or soapwort; the latter (b) appeared "disshveled" and are a persistent garden discard especially along railroad tracks over a wide northerly and middle range

of the U. S. and are not accompanied by the single or semi-double kinds. The book is a valuable treatise that is not meant to be encyclopedic in scope; it does have a helpful bibliography and an index of reported double flowers. I found it very interesting and I hope that many of our readers will too.

"FLORIDA MARINE SHELLS: A Guide for Collectors of Shells of the Southeastern Atlantic Coast and Gulf Coast Second Edition" by C. N. Vilas & N. R. Vilas, 108 pp., 12 color pl. w. 145 shells, 2 b/w pl. w. 27 shells, 1 map & 6 fig. Charles E Tuttle Co., Rutland, Vermont 05701. 1976. \$17.50.

"It has been the aim of the authors to design a book which would.....instruct the amateur collector without being too technical; aid in the identification of the most common shells without creating confusion, present a conception of the living mollusk, and create a substantial interest in shell collecting by means of colored illustrations, concise descriptions, clear basic classification, and general scientific facts." It does just this very well and has beautiful colored plates.

"APPLES: A Guide to the Identification of International Varieties" by John Bultitude, iii & 324 pp., ca. 250 color photo., 500 b/w photo. & 10 tab. University of Washington Press, Seattle, Washington 98105. 1983. \$50.00.

The author, an Englishman, has spent a half century on the propagation and care of fruits, mainly apples, and was awarded the M.B.E. in 1970 for the scope and quality of his horticultural service. The first part of the book has a brief introduction, a historical sketch, and current production information. The second part explains the identification of apples, lists varieties described and gives descriptions of 250 important varieties under longitudinal and cross-section photographs according to these diagnostic topics: history, general comments, tree, flowering, picking time, season, color, shape, size, basin, eye, cavity, stalk, flesh, synonyms and references. The color photos of each variety show a small cluster of the apples on their branches. They are naturally beautiful; one can almost taste and smell them! This book should prove valuable on an almost world-wide range.

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MAY 4 1984

REVISION OF THE HAWAIIAN SPECIES OF SANTALUM (SANTALACEAE)
HAWAIIAN PLANT STUDIES 109

Harold St. John
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ABSTRACT: Based on their morphology, the Hawaiian species of Santalum (Santalaceae) are revised, and including eight species and two varieties. New are S. involutum and S. majus of Kauai.

The genus Santalum is a noteworthy element in the flora of the Pacific Islnds. It was discovered in 1778 that trees of Santalum, with desirable fragrant wood, occurred in extensive groves in the Hawaiian Islands. The logs were felled, cut, and transported to the sea ports. For three decades they furnished a very profitable article of export. Harvested by the people, sold by the king and the chiefs, they were the first article of international commerce exported from the islands. In a single year, the amount realized from this export was \$400,000. This intensive exploitation soon brought the sandalwood trees to the vanishing point.

The first botanist to study and publish on Santalum in Hawaii was Charles Gaudichaud of the French expedition on the Uranie. He collected, described, named, and published (1829) S. Freycinetianum, and S. ellipticum, both from Oahu.

Hooker and Arnott (1832: 94) described a species from the island of Hawaii as S. paniculatum.

Asa Gray (1860: 326-327) accepted Gaudichaud's two species; reduced S. paniculatum H. & A. to varietal status and renamed it as S. Freycinetianum, var. latifolium Gray; and described the Kauai species as S. pyrularium Gray.

Heinrich Wawra (1875: 171) accepted Gray's treatment.

William Hillebrand (1888: 388-391) accepted three species and four varieties. These were S. pyrularium Gray, S. haleakalae Hbd., S. Freycinetianum Gaud., and var. latifolium Gray, var. ellipticum (Gaud.) Hbd., var. cuneatum Hbd., and var. littorale Hbd.

The first local monograph was by Joseph F. Rock (1916), and it was based on his field knowledge, and taxonomic study. He accepted nine species and two varieties of which four species and two varieties were new.

C. Skottsberg (1927) again monographed the local species, and during his studies he was the first to examine the type specimens of the known taxa.

His total was eight species and three varieties. Of these one species and three varieties were new.

L. Stemmermann (1981) made a revisional study of the genus in the Hawaiian Islands, accepting four species and five varieties. She included a key, an enumeration of the taxa, and synonymy. Of the varieties, one is a new combination, the other a novelty and for it there is a description and the listing of specimens.

There have been several smaller publications on Santalum, but the three monographs mentioned above are the important ones. The fact that in each of these three the taxonomy is quite different, shows that Santalum in Hawaii is diverse and that its classification is difficult. The systematic scheme here presented is based on all three previous ones, as well as on the author's field experience and study of herbarium specimens. It differs from Stemmermann's in the recognition of more species, in the relocation of S. Freycinetianum, var. auwahiense; in the reduction of S. ellipticum, var. littorale; and in the recognition of two new species on Kauai, S. involutum and S. majus.

This new classification accepts eight species and two varieties.

The introduced species, S. album L. is not herein treated.

Key to Species and Varieties

- A. Floral tube cylindric to campanulate, longer than wide,
 - B. Inflorescence terminal, dense, the bracts to 5 mm in length, persisting; blades coriaceous, elliptic to suborbicular. E. Maui. S. haleakalae.
 - B. Inflorescence axillary (or terminal),
 - C. Floral tube campanulate (or short cylindric); blades mostly lanceolate, conduplicate and falcate, (rarely elliptic and plane).
Oahu, Molokai. S. Freycinetianum.
 - C. Floral tube cylindric,
 - D. Blades glaucous below, elliptic to suborbicular. Lanai, Maui. S. lanaiense.
 - D. Blades not glaucous,
 - E. Flowers 16-19 mm long, the lobes 5-6 mm long; dried fruit 13 mm long; blades elliptic, flat, 20-36 mm wide. Kauai. S. majus.
 - E. Flowers 8-15 mm long,
 - F. Flowers 8-12 mm long, the lobes 3-4 mm long,
 - G. Blades linear elliptic, mostly folded or rolled; dried fruits 18-20 mm long. Kauai. S. involutum.

- G. Blades lanceolate to lance ovate or elliptic, mostly flat; dried fruits 7-12 mm long. Kauai.
S. pyrularium, var. pyrularium.
- F. Flowers 12-15 mm long, the lobes 5-7 mm long; blades lanceolate to ovate, flat or folded; dried fruits 12-14 mm long. Kauai.
S. pyrularium, var. sphaerolithos.
- A. Floral tube funnellform,
 H. Blades glaucous below; flowers 4.5-5 mm long.
 Hawaii. S. paniculatum, var. paniculatum.
- H. Blades green on both sides,
 I. Flowers 7-8 mm long. Hawaii.
S. paniculatum, var. Pilgeri.
- I. Flowers 4-7 mm long. Main H. I. and Laysan.
 S. ellipticum.

Enumeration of Taxa

- Santalum ellipticum* Gaud., Voy. Uranie Bot. 442, 1829.
- S. album L., var. ellipticum (Gaud.) Meurisse, Soc. Linn. Paris, Bull. 2: 1,025-1,027, 1892.
- S. Freycinetianum Gaud., var. cuneatum Hbd., Fl. Fl. Haw. Is. 389, 1888.
- S. Freycinetianum Gaud., var. littorale Hbd., Fl. Haw. Is. 390, 1888.
- S. Freycinetianum Gaud., var. ellipticum (Gaud.) Gray in Mann, Am. Acad. Arts Sci., Proc. 7: 198, 1867.
- S. cuneatum (Hbd.) Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 37, pl. XI, 1916.
- S. cuneatum (Hbd.) Rock, var. laysanicum Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 39, pl. XII, 1916.
- S. littorale (Hbd.) Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 41, pl. XIII, 1916.
- S. cuneatum (Hbd.) Rock, forma gracilius Skotts., (as var. in error), Bishop Mus., Bull. 43: 59, 1927, (see his pp. 56 and 57).
- S. ellipticum Gaud., var. littorale (Hbd.) Skotts., (as littorale), Bishop Mus., Bull. 43: 55, 1927.
- S. ellipticum Gaud., var. gracilius (Skotts.) Deg., Fl. Haw. 100: 10/4/37.
- S. ellipticum Gaud., forma physophora Deg., Fl. Haw. 100: 10/4/37.
- Holotype: Iles Sandwich, Voyage of the Uranie, 1817-1820, [Wahau, C. Gaudichaud]. (P)?
- Range: Laysan; Kauai to Hawaii.
- Discussion: All the investigators have considered this a variable group. From it there have been

described three species and five variations. Each new revision has produced a different number and grouping of the taxa. The latest, Stemmermann (1981: 49-51), accepted S. ellipticum Gaud. as the inland, erect kind. The marine littoral shrub with broader, succulent blades, she accepted as var. littorale (Hbd.) Skottsb. The latter is the most easily defined extreme of the population. A careful and comparative study of this broad group was made by Egler (1939). He concluded that it was a single variable species which at the sea beach was a low shrub with fleshy leaves, but further inland was progressively taller and with longer petioles, thinner leaves. The present writer had made similar observations of the littoral bushes and of the taller plant inland, up to 2,000 feet altitude or more, where it forms a small tree. He also comes to the same conclusion, that the best classification of the group is as a single species, S. ellipticum.

Santalum Freycinetianum Gaud., Voy. Uranie Bot. 442, 1829; Atlas t. 45, 1926-1830.

S. Freycinetianum, var. longifolium (Meurisse) Deg., Fl. Haw. 100: 8/6/37.

S. longifolium Meurisse, Linn. Soc. Paris, Bull. Mens. 2: 1,026, 1892.

Holotype: Iles Sandwich, Voy. Uranie, 1817-1820, [C. Gaudichaud], (P).

Range: Oahu, and apparently Molokai.

Santalum haleakalae Hbd., Fl. Haw. Is. 300, 1888.

Holotype: Maui, Haleakala, July 1858, W. Hillebrand (B), specimen now destroyed. Isotypes (BM, K).

Range: East Maui, middle and upper slopes of Haleakala.

Santalum involutum sp. nov. fig. 1.

Diagnosis Holotypi: Arbor glabra est, petiolis 9-17 mm longis, laminis $7.5-9.4 \times 1.4-1.8$ cm coriaceis lineari-ellipticis integribus subacutis in basi gracile cuneatis lateribus involutis, cymis 3-5 cm longis 9-15-floriferis, pedicellis 1-4 mm longis, floribus (siccis) 9-11 mm longis tubo cylindrico lobis 4 mm longis, drupis vivis 25×14 mm.

Diagnosis of Holotype: Trees to 6.6 m tall, glabrous; bark rather smooth, charcoal-colored; petioles 9-17 mm long, reddish; blades $7.5-9.4 \times 1.4-1.8$ cm, coriaceous, linear elliptic, entire, subacute, the base slenderly cuneate, the sides inrolled so that the blade appears tubular, above olive green, below pale green, lateral



Fig. 1

Santalum involutum St. John

veins inconspicuous; cymes terminal, 3-5 cm long, 9-15-flowered; peduncle 9-16 mm long; pedicels 1-4 mm long; flowers (dried) 9-11 mm long (14 when fresh), the perigonal tube cylindric, 5 mm in diameter, greenish yellow, the 4 lobes 4 mm long, (5.5 when fresh); drupes 18-20 \times 8-10 mm, (25 \times 14 when fresh), ellipsoid, angular, including the 3 mm apical cupulate rim.

Expanded Description: Trees 4-8.3 m tall, 15-35 cm in diameter; blades 1.4-1.8 (-2.7) cm wide; cymes 5-15-flowered; drupes 15-20 mm long, the beak 3-5 mm long.

Holotypus: Hawaiian Islands, Kauai Island, between Ke'e and Hanakapiai, ridge top on n. e. side of last stream n. e. of Hanakapiai, dryland forest, with Metrosideros, Acacia Koa, Elaeocarpus, Dicranopteris, 1,000 to 1,200 ft alt., July 25, 1976, Charles Christensen 38 (BISH).

Specimens Examined: Hawaiian Islands, Kauai Island, Napali Coast, ridge e. of Hanakapiai Stream, dryland forest of Diospyros ferrea, 800-1,200 ft alt., Aug. 28, 1976, Christensen 57; crest of Waioli-Waipa Ridge, in koa forest, 1,100 ft alt., Oct. 18, 1976, Christensen 69; Wainiha Valley, 1 1/8 mile in from last house, wet hillside, 650 ft alt., Jan. 21, 1977, Christensen 121, Lumhai-Wainiha Ridge, side of ridge, 1,000 ft alt., April 9, 1977, Christensen 182; near Kalahu, Kalalau Valley, Feb. 1, 1950, O. Degener & Wm. Hatheway 21,369; Wainiha Valley, dry lower forest, 400 ft elev., Jan. 1, 1934, H. St. John & F. R. Fosberg 13,946. The above are all in (BISH).

Range: Kauai, north coast from Wainiha to Kalalau, in the lower forests at from 400 to 1,200 feet altitude.

Discussion: S. involutum has as its closest relative S. majus St. John, of Kauai, a species with the petioles 6-8 mm long; blades 1.7-3.7 mm wide, elliptic, flat; cymes axillary, 4-5.5 cm long, 7-9-flowered; flowers (dried) 16-19 mm long, the lobes 5 mm long; and the drupes 13 \times 10 mm. S. involutum has the petioles 9-17 mm long; blades 1.4-1.8 (-2.7) cm wide, linear elliptic, the sides much involute; cymes terminal, 3-5 cm long, 9-15-flowered; flowers (dried) 9-11 mm long, the lobes 4 mm long; and the drupes 18-20 \times 8-10 mm.

The new epithet is the Latin adjective involutus. inrolled, and it is given with reference to the posture of the leaf blades.

Santalum lanaiense (Rock) Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 21, pl. III, 1916.

S. Freycinetianum Gaud., var. lanaiense Rock, Indig. Trees Hawaiian Is. 129, 131, 1913.

S. Freycinetianum Gaud., var. *auahiense* Stemmermann,
Pacif. Sci. 34: 45-47, fig. 1, (1980) = 1981.

Holotype: Lanai, on spur of the main ridge, Lanai-hale, about 3,000 ft. elev., July 1910, J. F. Rock 10,061 (BISH).

Range: Lanai, on the slopes from 300 to 1,000 feet, and on the mountain to 3,000 feet altitude; lower middle slopes of east Maui, especially at Auahi.

Santalum majus sp. nov. fig. 2.

Diagnosis Holotypi: Arbor 4-5 m alta glabra est, petiolis 6-8 mm longis, laminis 6.1-8 X 2.6-3.5 cm. subcoriaceis ellipticis planis acutis basi rotundata, cymis axillaribus 4-5.5 cm longis 7-9-floriferis, floribus siccis 16-19 mm longis lobis 5 mm longis ovatis acutis vel late lanceolatis, drupis 13 X 10 mm ellipsoid-eis.

Diagnosis of Holotype: Tree 4-5 m tall; herbage glabrous; petioles 6-8 mm long; blades 6.1-8 X 2.6-3.5 cm subcoriaceous, elliptic, flat, entire, the apex acute, the base rounded, above dark green, below green, the lateral veins inconspicuous; cymes axillary, 4-5.5 cm long, 7- or 9-flowered; peduncle 10-18 mm long; pedicels 2-3 mm long; flowers (dried) 16-19 mm long, 3 mm in diameter, the perigonal tube green, the 4 lobes 5 mm long, ovate and acute or broadly lanceolate, within greenish yellow to red; stamens 4; filaments 2 mm long, subulate; anthers 2 mm long, ellipsoid; style 10 mm long; stigma lobes 0.7 mm long, rounded; disk lobes 3.5 mm long, the apex globose, puberulent; drupes 13 X 10 mm ellipsoid, and at apex with a cupulate rim 1.5 mm high and 4.5 mm in diameter.

Expanded Description: Trees 20-30 cm in diameter; blades 6.1-9 X 1.7-3.7 cm; flowers 16-20 mm long, the lobes 5-6 mm long.

Holotypus: Hawaiian Islands, Kauai Island, Kumuwela Ditch Trail, along border between Kokee State Park and Na Pali-Kona Forest Reserve, 3,600-3,800 ft elev., 13 Aug. 1964, M. R. Crosby & W. R. Anderson 2,024 (BISH).

Specimens Examined: Hawaiian Islands, Kauai Island, Awaawapuhi Trail, Kokee State Park, July 17, 1970, D. Herbst 6,515; Helemanu forest, Feb. 14-26, 1909, J. F. Rock 1,834; Milolii Ridge, Waimea, open koa forest, 2,050 ft alt., Dec. 27, 1933, H. St. John & F. R. Fosberg 13,753; Kokee, vicinity of forest ranger station, transition between wet and dry forest, 3,500 ft alt., Aug. 1961, W. L. Stern & S. Carlquist 1,278. All the above are in (BISH).

Range: Kauai, Kokee region, 2,050 to 3,800 feet alt.

Discussion: The closest relative of *S. majus* is



Fig. 2

Santalum majus St. John

S. involutum St. John, and under the treatment of that species the contrasting characters are stated.

The new epithet is the Latin comparative adjective, majus, larger, and it is used with reference to the larger size of the leaf blades.

Santalum paniculatum H. & A., Bot. Beechey Voy. 94, 1832, var. paniculatum.

S. Pilgeri Rock, var. luteum Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 31, pl. IX, 1916.

S. ellipticum Gaud., var. luteum (Rock) Deg., Fl. Haw. Is. 100: 10/4/37.

S. ellipticum, var. annectens Deg., Fl. Haw. Is. 100: 10/4/37.

S. ellipticum, var. chartaceum Deg. & Deg., Phytologia 27: 145, 1973.

Holotype: Ins. Sandwich, Hawaii, near Kilauea, Maio 1825, Macrae (K).

Range: Hawaii, slopes of Mauna Kea, Mauna Loa, and Hualalai.

S. paniculatum H. & A., var. Pilgeri (Rock) Stemmermann, Pacif. Sci. 34: 52, (1980) = 1981.

S. Pilgeri Rock, Hawaii Bd. Agr. For., Bot. Bull. 3: 29, pl. VIII, 1916.

Holotype: Hawaiian Islands, Hawaii Island, Pulehua above Kealakekua, on aa lava flow, 5,000 ft elev., Feb. 10, 1912, J. F. Rock 10,033 (BISH).

Range: Hawaii, woods of North Kona, and South Kona.

Santalum pyricularium Gray, A. Acad. Arts Sci., Proc. 4: 326-327, 1860.

S. Freycinetianum Gaud., var. pyricularium (Gray) Stemm., Pacif. Sci. 34: 48, (1980) = 1981.

Holotype: Sandwich Islands, Kauai, Wilkes Expedition (US).

Range: Hawaiian Islands, Kauai Island, moist forest on the mountains.

S. pyricularium Gray, var. sphaerotherithos Skottsb., Göteborg. Bot. Trädg., Meddel. 15: 359. figs. 294-295, 1944.

Holotype: Hawaiian Islands, Kauai Island, trail from Lehua makanoe to Kilohana, 16/8/38, L. M. Cranwell & C. Skottsberg 2,979 (BISH).

Literature Cited

1939.
Egler, Frank E., *Santalum ellipticum*, a Restatement of Gaudichaud's Species. Bishop Mus., Occas. Papers 14(21): 349-357.

- Hillebrand, William, 1888. Flora of the Hawaiian Islands, I-XCVI, 1-673, 3 maps.
- Gaudichaud, Charles, 1829-1830. Voyage authour du monde sur l'Uranie, 1817-1820. i-vii, 1-522; Atlas. 1826-1830, 1-22, pl. 1-120.
- Gray, Asa, 1860. Diagnosis of the Species of Sandal-wood (Santalum) of the Sandwich Islands. Am. Acad. Arts Sci., Proc. 4: 326-327.
- Hooker, W. J. and G. A. Walker-Arnott, 1830-1841. The botany of Captain Beechey's voyage . . . i-ii, 1-485, pl. 1-99.
- Rock, Joseph F., 1916. The Sandalwoods of Hawaii. Hawaii Bd. Agr. For., Bot. Bull. 3: 1-43, pl. I-XIII.
- Skottsberg, C. 1927. Artemisia, Scaevola, Santalum, and Vaccinium of Hawaii. Bishop Mus., Bull. 43: 1-89, figs. 1-30, pl. I-VIII.
- Stemmermann, Lani, 1981. Observations on the Genus Santalum (Santalaceae) in Hawai'i. Pacif. Sci. 34: 41-54, fig. 1.
- Wawra, Heinrich, 1872-1875. Beiträge zur Flora der Hawai'schen Inseln. Flora vols. 55-58; (in reprint 124-125).

Legend

- Fig. 1. Santalum involutum St. John, from holotype.
a, habit, X 1; b, bud, X 2; c, fruit, X 2.
- Fig. 2. Santalum majus St. John, from holotype.
a, habit, X 1; b, flower, X 2; c, flower, cut open, X 2;
d, stamen and disk lobes, X 4; e, fruit, X 2.

CAMELINA RUMELICA, ANOTHER WEEDY MUSTARD
ESTABLISHED IN NORTH AMERICA

Ronald L. McGregor
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While collecting in southcentral Kansas and northcentral Oklahoma during the spring of 1983 I frequently found a Camelina sp. growing in wheat fields, along roads, in grazed prairie pastures, and waste places. It differed from C. microcarpa Andr. ex DC. in having petals 6-9 mm long and pure white at anthesis, lower stem densely pilose-hirsute with simple hairs 2-3.5 mm long, rosette leaves usually still present at early anthesis, chromosome number $n=6$, and well-grown plants more branched. Like C. microcarpa, the plants are usually winter annuals.

Eventually I determined this rather conspicuous plant to be C. rumelica Velen., a native of southern and eastcentral Europe, and could not find it reported for North America. Prof. Reed C. Rollins, of Harvard University, confirmed my determination and I thank him for his assistance.

It was apparent that C. rumelica was well established over a several county area. Farmers in the vicinity recognized it as different from C. microcarpa, somewhat more noxious, and two said it had been around for a long time. I found C. rumelica in pure colonies and mixed with C. microcarpa though the latter species was more common in the area.

The prevalence of C. rumelica suggested that it had been around for some time and earlier collections possibly incorrectly identified as C. microcarpa. A study of Camelina specimens in regional herbaria (COLO, CS, DUR, IA, ISC, KSC, KANU, MIN, MO, NDA, NEB, NMC, OKL, OKLA, SDC, SDU, SMU, TAES, TEX, UARK, UMO; I thank the Curators for their assistance) revealed this to be true.

The first collections appear to be OKLAHOMA: Woods Co., bad weed in wheat fields, 30 Apr 1932, Charles Stiles s.n. (MO); Kingfisher Co., 2 mi E Kingfisher, 15 Apr 1937, Jack Engleman 1380 (OKL); near Kingfisher, wheat fields, 21 Apr 1937, R.C. Outhier s.n. (TEX). KANSAS: Stafford Co., near Macksville, abundant in wheat field, May 1947, Don Gibson s.n. (KSC). TEXAS: Denton Co., 1.3 mi N Aubrey, along railroad, locally abundant, 9 Apr 1953, Lloyd H. Shinnars 14098 (SMU); Wise Co., 5.2 mi SE Bridgeport, along railroad fill, locally abundant, 27 Mar 1953, Lloyd H. Shinnars 13857 (OKLA, SMU, TAES, UARK). COLORADO: Kiowa Co., 2 mi N Eads, sandy sagebrush pasture, common, 25 May 1973, Steve Stephens 64712 (KANU); Montrose Co., 1.3 mi N turnoff to Black

Canyon National Monument, off U.S. Hwy. 50, roadside weed, petals white, 28 May 1979, Reed C. and Kathryn W. Rollins 7989 (GH). Prof. Reed C. Rollins (pers. com.) reports this latter sheet was the only one in the Gray Herbarium from North America. OREGON: Deschutes Co., 8 mi SE of jct. of hwy. 20 and 28 on Hwy. 20, on barren flats in juniper-Chrysothamnus-Purshia-sagebrush association, 3 Jul 1950, A.R. Kruckeberg 2069 (COLO).

Other collections of C. rumelica found are:

KANSAS: Barber Co., McGregor 34261; Chautauqua Co., Ralph E. Brooks 12915; Clark Co., McGregor 32941; Comanche Co., McGregor 34209; Harper Co., McGregor 34308; Kingman Co., McGregor 34312; Kiowa Co., Steve Stephens 83670; Logan Co., Steve Stephens 64588; Pratt Co., Janet E. Bare 2232, Ralph E. Brooks 16667, McGregor 34247; Reno Co., McGregor 34243 (all KANU).

OKLAHOMA: Alfalfa Co., McGregor 34298 (KANU); Cleveland Co., George J. Goodman 7097 (SMU, OKL); Cotton Co., Ricky Sellers 114 (DUR); Grady Co., Robert Pearce 1115 (KSC, OKL, SMU); Grant Co., McGregor 34299 (KANU); Harper Co., John & Connie Taylor 31409 (DUR); Love Co., Curtis Clark & Ethen Perkins 112 (OKL); Major Co., Sue Young 40 (OKL); John & Connie Taylor 15910 (DUR); Muskogee Co., Charles Wallis 3524 (OKLA); Pontotoc Co., Doyle McCoy 3162 (OKLA); Tillman Co., V. Watson 54 (DUR); Woods Co., P. Nighswonger 932 (OKL), Tim Springer 143 (OKL), John Taylor 28790 (DUR), McGregor 34280 (KANU); Woodward Co., Steve Stephens 74758 (KANU).

TEXAS: Hemphill Co., Charles Wallis 8663 (OKLA).

The only other Camelina species which have been collected in the plains region are C. alyssum (Mill.) Thell. and C. sativa (L.) Crantz. The former from North and South Dakota with last collection being North Dakota: Dickey Co., 23 Jun 1950, G.K. Dike s.n. (NDA). Camelina sativa has been collected from Kansas and Missouri northward with the last collection being North Dakota: Ward Co., Minot, wheat field, 22 Jun 1930, Olga Lakela 472 (MIN).

In recent years some Camelina specimens from Oklahoma northward have been annotated as C. sativa. Such plants have the lower stem with a few to many short branched hairs and longer simple ones absent to sparse. The fruit and seed characters are, however, those of C. microcarpa. In many populations of C. microcarpa stem pubescence varies considerably and its use as a diagnostic character must be used with caution.

A NEW SPECIES OF ARGYTHAMNIA (EUPHORBIACEAE) FROM MEXICO

John Ingram

L. H. Bailey Hortorium
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ARGYTHAMNIA LOTTIAE J. Ingram, sp. nov.

Frutex dioecius vel monoecius ad 1.5 m altus; folia elliptica, 3-8.5 cm longa, 1.5-3.8 cm lata, apice plerumque rotundata, aliquando obtusa, basi acuta vel obtusa, superficiebus ambabus oculo nudo visis apparenter glabris sed pilos malpighiaceos gerentibus, aliquos 1.5 mm longos sed plurimos ca. 0.5 mm longos, venis in superficie infera pilis malpighiaceis 1.5 mm longis praeditis, marginibus quasi integris sed glandulas aliquando gerentibus. Inflorescentia 0.8-1.5 cm longa, pilis malpighiaceis dense praedita. *Flores masculi*: sepala 4, elliptica, 1.5 mm longa, ca. 0.75 mm lata, intus glabra, extus pilis malpighiaceis densis appressis induta, acuta; petala 4, latissime ovata vel depresso-ovata, unguiculata, filamentum amplexentia, ca. 1.5 mm longa, ca. 1.5 mm lata, ad androphorum adnata, intus praeter aream pilorum ad juncturam laminae et unguis glabra, extus pilis malpighiaceis praedita; stamina 4, exserta, filamentis ca. 0.75 mm longis, basi dilatis et piliferis. *Flores feminei*: sepala 5, ovata, 4 mm longa, 1.5-2 mm lata, intus pilis malpighiaceis et simplicibus praedita, extus pilis malpighiaceis densis praedita, acuta; petala nulla vel rudimentaria; glandes in ambitu radali rectangulares, glabrae; semina globosa, 2.2-5 mm alta lataque, porcis irregularibus asperata.

Dioecious or monoecious shrub 1.5 m tall, the stems at first bearing malpighiaceous hairs, becoming glabrous; leaves elliptic, 3-8.5 cm long, 1.5-3.8 cm wide, apex mostly rounded, sometimes obtuse, base acute to obtuse, both surfaces appearing glabrous to the naked eye but bearing malpighiaceous hairs, some 1.5 mm long but mostly ca. 0.5 mm long, the veins on lower surface with malpighiaceous hairs 1.5 mm long, margins essentially entire but bearing occasional glands; petioles 2.5-3 mm long, with malpighiaceous hairs; stipules narrowly triangular, ca. 2 mm long. Inflorescence 0.8-1.5 cm long, with dense malpighiaceous hairs. *Staminate flowers*: sepals 4, elliptic, 1.5 mm long, ca. 0.75 mm wide, glabrous on interior, with dense, appressed, malpighiaceous hairs on exterior, acute; petals 4, very broadly ovate to depressed-ovate, clawed, enfolding the filament, ca. 1.5 mm long, ca. 1.5 mm wide, united to the androphore, glabrous on the inte-

rior except for a patch of hairs at juncture of blade and claw, with malpighiaceae hairs on exterior; glands 4, globose, glabrous; stamens 4, exserted, filaments ca. 0.75 mm long, dilated and hairy at the base. *Pistillate flowers*: sepals 5, ovate, 4 mm long, 1.5-2 mm wide, with malpighiaceae and simple hairs on interior, with dense malpighiaceae hairs on exterior, acute, petals absent or rudimentary; glands 5, rectangular in radial outline, glabrous; ovary with dense malpighiaceae hairs, the styles distinct except at the base, twice bifid, with malpighiaceae hairs, the stigmas slightly flattened; seeds globose, 2-2.25 mm high and wide, roughened with irregular ridges.

Type: MEXICO. Jalisco: Mpio. La Huerta; Estación de Biología Chamela (UNAM). Lat. 19° 30' N; Long. 105° 03' W. 11 Oct 1982, *Emily J. Lott 1451* (holotype, BH!).

Additional specimens examined: Jalisco: Bottom of cañada, mouth of Cuenca 4, Selva Tropical Caducifolia or subcaducifolia, near Estación Biología Chamela, 10 Dec 1981, *Stephen H. Bullock 1047* (BH); Mouth of "Cuenca 4", selva tropical caducifolia, near Ext. Biol. Chamela, 11 Nov 1981, *Stephen H. Bullock 1020* (BH).

Argythamnia lottiae seems to show a close relationship to *A. moorei* and *A. coatepensis*. It differs from *A. moorei* in that its leaves are serrulate and glabrous on the upper surface, inflorescences 2.5-5.5 cm long, and pistillate flowers with well-developed petals and triangular glands. It differs from *A. coatepensis* in its ovate leaves that are densely hairy on both surfaces, inflorescences 2.5-5.5 cm long, staminate flowers with petals hairy on both surfaces, and pistillate flowers with well-developed petals.

This species is named for Emily J. Lott, who has provided me specimens of the new species. The Latin diagnosis is by Dr. William J. Dress; the illustration is from the skilled hand of Bente King Everhart.

ILLUSTRATION

Fig. 1. *Argythamnia lottiae*: a, branch; b, leaf, upper surface; c, leaf, lower surface; d, leaf, upper surface; e, leaf, lower surface; f, staminate flower; g, sepal of staminate flower, lower surface; h, sepal of staminate flower, upper surface; i, petal of staminate flower, lower surface; j, petal of staminate flower, upper surface; k, pistillate flower; l, sepal of pistillate flower, lower surface; m, sepal of pistillate flower, upper surface; n, seed. (a-j, n, *Lott 1451* [BH, holotype]; k-m, *Bullock 1047* [BH]).

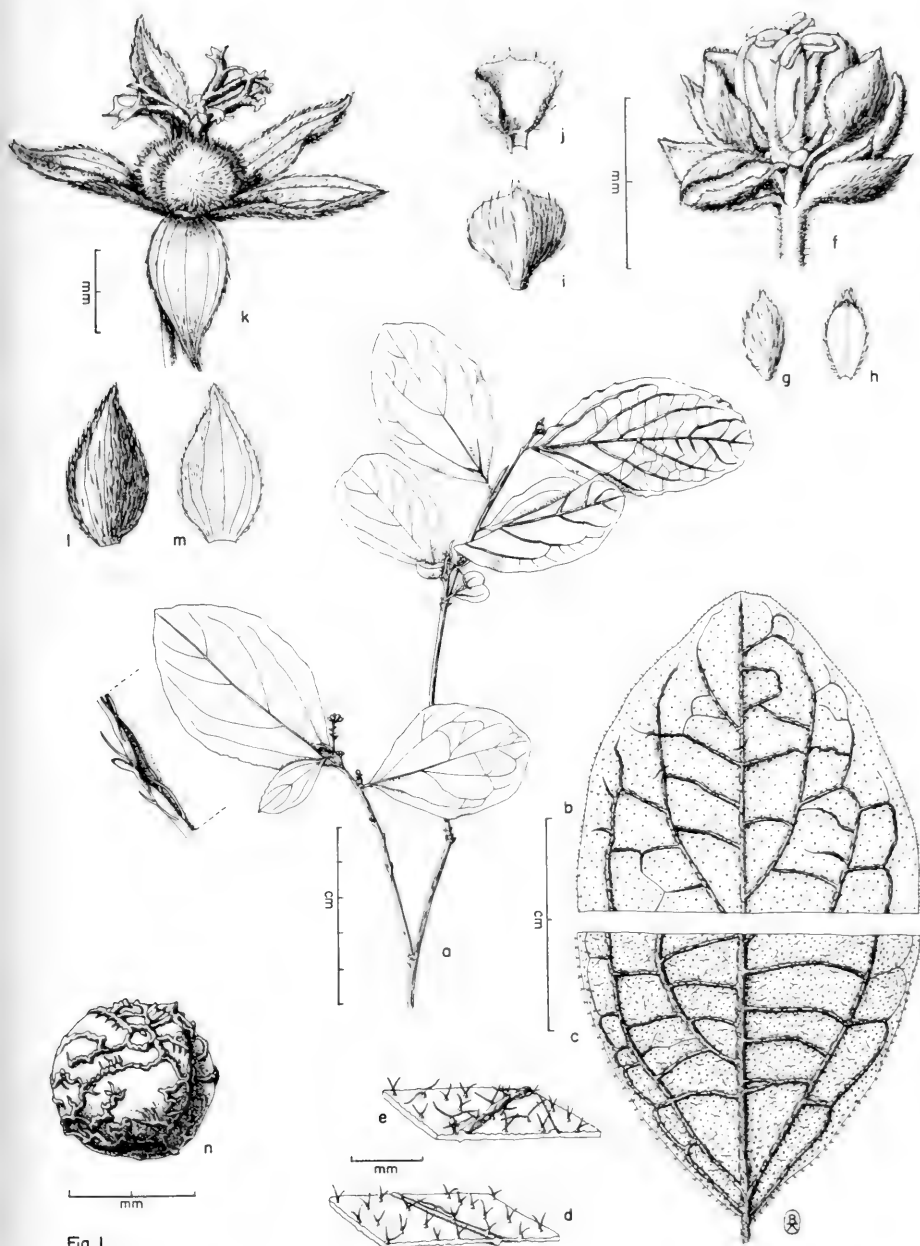


Fig. 1

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXIV

Harold N. Moldenke

AEGIPHILA LORETENSIS Mold., sp. nov.

Frutex 2.5 m. altus ramosus, ramis griseis glabris, ramulis gracilibus adpresso-villosis; foliis decussato-oppositis; petiolis brevibus ca. 5 mm. longis densissime villosis; laminis oblongo-ellipticis 5--12.5 cm. longis 3.5--5 cm. latis apicaliter breviter acuminatis marginaliter integris basaliter obtusis vel subacutis supra glabris nitidisque subtus adpresso-villosulis; inflorescentiis axillaribus laxe multifloris densissime villosis.

A shrub, about 2.5 m. tall, branched; branches gray, glabrous; younger branchlets slender, densely appressed-villous or villosulous with whitish or tan-colored hair; leaves decussate-opposite; petioles very short, only about 5 mm. long, very densely villous like the branchlets, the hairs widely spreading; leaf-blades thin-chartaceous, dark-green, shiny, and glabrous above, lighter green and villosulous (especially on the larger venation) beneath, oblong-elliptic, 5--12.5 cm. long, 3.5--5 cm. wide, apically short-acuminate, marginally entire, basally obtuse to subacute; inflorescence axillary, loosely rather many-flowered, the very slender or subfiliform peduncles, inflorescence-branches, pedicels, and exterior of the calyx densely villous with comparatively long and spreading whitish or yellowish hairs, the filiform pedicels elongate, about 5 mm. long; calyx campanulate, about 2 mm. long and wide.

The type of this very distinct species was collected by F. Encarnación (no. 26125) about 3.5 km. from the center of the forest at S. Herrera along the Río Ucayali, in the province of Requena, Loreto, Peru, on August 18, 1982, and is deposited in the United States National Herbarium at Washington. The collector notes: "copa verde amarillente, tronco DAP < 5 cm. Bosque colina."

ALOYSIA VIRGATA var. *ARGUTEDENTATA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum marginaliter argute serrato-dentatis recedit.

This variety differs from the typical form of the species in its leaf-blades having their margins rather sharply serrate-dentate, the teeth antorsely pointed.

The variety is based on *S. Venturi* 5764 from Cerro del Nemate, in the department of C. Pellegrini, Santiago del Estero, Argentina, collected at 550 m. altitude on January 14, 1928, and deposited in the United States National Herbarium at Washington. The collector refers to the plant as an "arbusto delgado".

BOUCHEA BECKII Mold., sp. nov.

Herba perenna, ramis ramulisque sublignosis obtuse tetragonis densissime adpresso-puberulis; foliis decussato-oppositis parvi-

oribus petiolatis; petiolis gracilibus 5--10 mm. longis dense puberulis pilosulisve; laminis foliorum membranaceis utrinque viridibus ellipticis 2--4.5 cm. longis 1--2 cm. latis apicaliter acutis marginaliter argute-serratis basaliter longe cuneato-attenuatis subtus dense puberulis; inflorescentiis terminalibus spicatis simplicibus solitariis laxe multifloris unique densissime puberulis; bracteolis parvis ovatis ca. 5 mm. longis apicaliter longe attenuatis.

A subligneous perennial herb, to about 1 m. tall; stems and branches stout, rather woody, gray, densely puberulent, obtusely tetragonal; youngest twigs slender, more sharply tetragonal, densely puberulent; leaves decussate-opposite, petiolate; petioles slender, 5--10 mm. long, densely puberulent or pilosulous; leaf-blades membranous, rather uniformly green on both surfaces, elliptic, 2--4.5 cm. long, 1--2 cm. wide, quite uniform, apically sharply acute, marginally acutely serrate to slightly below the middle with ovate antrorse teeth, basally long-attenuate into the petiole, puberulent on both surfaces, more densely and conspicuously so beneath; inflorescence spicate, terminal, simple, solitary on each twig, uniformly and densely brownish-puberulent throughout; bractlets small, ovate, about 5 mm. long, apically long-attenuate, about 1/3 as long as the calyx; calyx very slender, cylindric, 10--12 mm. long, externally densely puberulent, the rim deeply 5-toothed, the teeth apically apiculate.

This distinct species is based on *Beck & Liberman 9830* from Monteagudo, 28 km. from Camiri, at 1100 m. altitude, in the province of Luis Calvo, Chuquisaca, Bolivia, collected on October 28, 1983, and deposited in the Lundell Herbarium at the University of Texas, Austin.

STACHYTARPHETA RESTINGENSIS var. *HISPIDULA* Mold., var. nov.

Haec varietas a forma typica speciei ramulis distincte albido-hispidulis recedit.

This variety differs from the typical form of the species in having its branchlets distinctly and abundantly white-hispidulous.

The variety is based on *L. R. Landrum 4170* from among shrubby vegetation in sandy soil at Marica, Restinga de Marica, between the ocean and Lagoa de Marica, about 40 km. east of Rio de Janeiro, Rio de Janeiro, Brazil, collected on January 21, 1982, and deposited in the Britton Herbarium at the New York Botanical Garden.

STACHYTARPHETA CANESCENS var. *ELLIPTICA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum perspicue ellipticis usque ad 8 cm. longis 2.5 cm. latis differt.

This variety differs from the typical form of the species chiefly in having its leaf-blades conspicuously and uniformly elliptic, to 8 cm. long and 2.5 cm. wide, long-cuneate into the sessile base.

The variety is based on *G. Hatschbach & O. Guimarães 47023*, collected on campo de restinga in the vicinity of Nova Viçosa, Bahia, Brazil, on October 19, 1983, deposited in the Lundell Herbarium at the University of Texas. The collectors note that the plant was a subshrub, 50 cm. tall, with violet corollas.

STACHYTARPHETA GRISEA Mold., sp. nov.

Herba perennis multiramosa, ramis ramulisque gracilibus dense griseo-puberulentis, laminis foliorum anguste ellipticis 1.5--3.5 cm. longis 5--10 mm. latis apicaliter acutis marginaliter minute adpresso-serrulatis basalibus in petiolum brevem longe acuminatis ubique densissime groseo- vel albo-pulverulentis vel pulverulento-puberulis, inflorescentiis terminalibus spicatis solitariis gracillimis multifloris ca. 10 cm. longis ubique densissime adpresso-puberulis, pilis antrorsis, corollas sanguineis.

A perennial herb with a woody taproot; branches and branchlets many, erect or ascending, rather short, foliose, very slender, densely gray- or white-puberulent with antrorsely subappressed very short hairs; leaves decussate-opposite, numerous, short-petiolate or almost sessile; leaf-blades membranous, narrowly elliptic, 1.5--3.5 cm. long, 5--10 mm. wide, apically acute, marginally serrulate above the middle with very minute, appressed, antrorse, inconspicuous teeth, entire below the middle, basally long-acuminate into the winged petiole, densely puberulent on both surfaces with very short hairs, mostly also conspicuously gray- or white-pulverulent, the venation especially white and conspicuous; inflorescence spicate, terminal, solitary, simple, up to about 10 cm. long, many-flowered, very slender, densely puberulent throughout with very tiny suberect or antrorse hairs; bracts narrowly lanceolate, about 5 mm. long, apically long-attenuate; calyx narrowly cylindric, equaling or slightly surpassing the subtending bract; corolla dull crimson.

The type of this very distinct species was collected by A. O. Chater, E. Cabrera, G. Davidse, and M. Souse (*Chater 18*) along a roadside at the edge of a deciduous forest at 10 m. altitude 4 km. west of Puerto Morelos, Quintana Roo, Mexico, on May 5, 1982, and is deposited in the herbarium of the Missouri Botanical Garden.

GMElina PHILIPPENSIS f. *VIRIDIBRACTEATA* (Kuntze) Mold., comb. nov.

Gmelina finslaysoniana var. *silvestris* f. *viridibracteata* Kuntze, Rev. Gen. Pl. 2: 507. 1891.

GMElina PHILIPPENSIS f. *COLORATA* (Kuntze) Mold., comb. nov.

Gmelina finslaysoniana var. *silvestris* f. *colorata* Kuntze, Rev. Gen. Pl. 2: 507. 1891.

NEOTROPICAL MYRSINACEAE -- XI

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AMATLANIA Lundell, *Wrightia* 7: 38. 1982

AMATLANIA PECTINATA (Donn. Sm.) Lundell, comb. nov.

Ardisia pectinata Donn. Sm., Bot. Gaz. 12: 132. 1887. Amatlanian
pellucida var. pectinata (Donn. Sm.) Lundell, *Wrightia* 7: 40.
1982.

Guatemala: Dept. Alta Verapaz, H. von Tuerckheim 942
(holotype, US; fragment & photo, LL). Dept. Baja Verapaz,
along dirt road 4 miles NE of Purulha, disturbed primary
forest, elev. 1500 m., July 17, 1977, Thomas B. Croat 41325
(fragment & xerox, LL; MO), shrub, 3 m., flowers reddish-
violet.

The collection by Croat is the first good material of the
species aside from the type collection. A. pectinata is
distinct from A. pellucida (Oerst.) Lundell as represented by
the type and the Croat collection. It is apparently rare.

AURICULARDISIA Lundell, *Phytologia* 49: 341. 1981

AURICULARDISIA KNAPPII Lundell, sp. nov. -- Arbor parva,
4--5 m. alta, rufo-furfuracea; folia magna, coriacea, longe
petiolata, petiolo crasso, marginato, ad 6.5 cm. longo, perad-
presse furfuraceo; lamina elliptico-oblongata, ad 46 cm.
longa, 12.5 cm. lata, apice obtusa, basi subcuneata, integra,
subtus reticulata, punctata; inflorescentia axillaris, anguste
paniculata, ca. 15 cm. longa, basi ca. 5 cm. lata, rufo-
furfuracea, longe pedunculata; flores capitellati; pedicelli
crassi, 1--2 mm. longi; sepala 5, ovato-elliptica, 1.8--2.4 mm.
longa, acuta, fimbriato-auriculata, furfuracea, nigropunctata;
ovarium glabrum; ovula 9.

Panama: Province of San Blas, 23--29 km. from Pan-
American Hwy. on El Llano-Carti Road, forest and forest edges
along road, tropical wet forest, elev. 300--400 m., Oct. 28,
1981, S. Knapp 1843 (holotype, LL), treelet 4--5 m., inflores-
cence rachis very dark reddish-brown, fruit maroon and fleshy.

The furfuraceous flowers are in small peduncled heads and
nearly sessile, with pedicels nearly as thick as the flowers.

The distinctive sepals, covered and bordered by large scales, have a conspicuous hyaline fimbriate margin on the covered edge. Its thickly coriaceous leaves have rather obscure reticulation on the lower surface.

AURICULARDISIA PLEUROBOTRYA (Donn. Sm.) Lundell var.

PARVA Lundell, var. nov. -- Frutex, 4 m.; ramuli crassiusculi, adpresse furfuracei; folia parva, supra glabra, subtus dense adpresse furfuracea, petiolata, petiolo 3--7 mm. longo, canaliculato; lamina subcoriacea, oblanceolata, 2.5--6 cm. longa, 1.3--1.7 cm. lata, apice acuta vel subacuminata, basi acuminata; inflorescentia longe pedicellata, paniculata, ad 5 cm. longa, adpresse furfuracea; flores subcorymbosi; pedicelli ad 1 cm. longi; sepala 5, ovata, ad 2.2 mm. longa, furfuracea, auriculata, fimbriata, apice acutiuscula, minute aurantiaco-punctata; corolla glabra, punctata; ovarium glabrum.

Panama: Bocas del Toro, Upper Rio Colubre, elev. 2500--3000 m., August 1983, L. D. Gomez, R. Chacon, I. Chacon, Gerardo Herrera 21919 (holotype, LL), shrub 4 m., flowers pale pink, stamens brown, ovary red.

The very small leaves, appressed furfuraceous beneath, small stalked inflorescence of two to several corymbs, flowers with pedicels up to 1 cm. long, and typically asymmetrical sepals with hyaline fimbriate auricle on overlapped edge well-mark this variety. Only flower buds are available.

This taxon, which grows above 2500 meters, appears to be a diminutive form of Auriculardisia pleurobotrya (Donn. Sm.) Lundell, and all parts of the variety are smaller than the species.

IBARRAEA Lundell, *Phytologia* 48: 137. 1981

IBARRAEA WENDTII Lundell, *Wrightia* 7: 46. 1982.

Mexico: Veracruz, Municipio Hidalgotitlan, lado O del Rio Cuevas, un poco al N del Poblado 6, en selva perturbada, elev. 140 m., July 19, 1980, Tom Wendt, A. Villalobos C., & I. Navarrete 2625 (LL), arbolito de 4 m. de alto. Municipio Minatitlan, 21 km. al norte de Uxpanapa, sobre el camino a Ejido Los Liberales y el Poblado 13, orilla del arroyo, elev. 150 m., July 21, 1980, Wendt et al. 2662 (LL), arbolito. Municipio Minatitlan, loma grande, elev. ca. 900 m., al S de Poblado 11, ca. 27 km. al E de La Laguna, Wendt et al. 4023 (LL), arbolito. Municipio Minatitlan, 1 km. al NO de Pob. 13 en el camino a Uxpanapa (Pob. 12), orilla de arroyo pedregoso seco, elev. 130 m., May 16, 1983, Wendt et al. 4087 (LL), arbolito de 4--5 m., petalos y sepalos blancos con puntitos anaranjados concentrados cerca de los apices, petalos con una mancha de amarillo muy palida cerca de la base, flores ligeramente fragantes. Municipio Minatitlan, Cerro Blanco,

ca. 7 km. al NE de Uxpanapa en el camino al Pob. 15, cima del cerro, elev. 450 m., May 29, 1983, Wendt et al. 4167 (LL), arbolito de 3 m., botones blancos.

From the region where the type was collected, all these collections appear to be referable to I. Wendtii. The flexuous weak inflorescence branches suggest I. Tonii Lundell of Chiapas, known only from a fruiting collection. The two taxa may be related, but I. Tonii differs in punctuation, flowers 4- or 5-parted, and leaf form.

PARATHESIS (A.DC.) Hooker f., Bentham & Hooker f.,
Gen. 2: 645. 1876

PARATHESIS CARTAGOANA Lundell, sp. nov. -- Arbor, 20 m., brunneo-tomentosa; ramuli crassi, tomentosi; folia tomentosa, magna, longe petiolata, petiolo crasso, ad 3.5 cm. longo, canaliculato; lamina coriacea, oblonga vel elliptica, ad 30 cm. longa, 10.5 cm. lata, apice abrupte acuminata, basi acuta, minute denticulata, supra venosa, subglabra, subtus dense tomentosa; inflorescentia terminalis, magna, pyramidalis, tomentosa, paniculata, ad 30 cm. longa; flores corymbosi; pedicelli crassi, tomentelli, ca. 5 mm. longi; sepala coriacea, anguste triangulata, 3 mm. longa, acuminata, extus tomentella; corolla ca. 9 mm. longa, extus tomentella; petala basi connata, lanceolata, ca. 7 mm. longa, lineata, intus villosa, basi glabra; stamina erecta, ca. 5 mm. longa; filamenta crassa, punctata, ca. 2.75 mm. longa; antherae ovato-ellipticae, ca. 3.2 mm. longae, apice apiculatae, dorso nigro-punctatae; ovarium tomentellum; ovula 12.

Costa Rica: Province Cartago, edge of pasture, above Rio Turrialba, 2.5 km. E of Trinidad, alt. 1680 m., June 15, 1969, Roy W. Lent 1739 (holotype, F; fragment & xerox, LL), tree of 20 m., petals lavender, fruit black with brown pubescence.

With the collections available of the two taxa, P. amplifolia Lundell of the lowlands of Panama and P. cartagoana at a higher elevation in Costa Rica, the two taxa are vegetatively difficult to separate. However, the slender small versatile anthers of P. amplifolia borne on slender elongated filaments are altogether different from the large erect ovate-elliptic anthers of P. cartagoana which are borne on thick much shorter filaments. The brownish indument of the two taxa, size of leaves and inflorescences are very similar. P. cartagoana has leaves with denticulate margins and the veins above are strongly impressed. Because of larger flowers in P. cartagoana, differing in important features, two taxa are recognized.

A third older taxon, P. bicolor Lundell, has similar reddish-brown indument and vegetative features, but unfortunately it is known only from fruiting collections. The

fruiting sepal of P. bicolor is broadly triangular, only about 2 mm. long and nearly as wide at base. Flowers are needed to determine the relationship of P. bicolor to P. amplifolia and P. cartagoana.

Only P. cartagoana has denticulate leaves; the margins in the other two are entire, a minor yet diagnostic feature worth noting.

PARATHESIS CINTALAPANA Lundell, sp. nov. -- Arbor, ca. 7 m. alta; ramuli graciles, glabrati; folia parva, petiolata, petiolo ad 1.2 cm. longo; lamina membranacea, glabra, oblanceolata, 5--10 cm. longa, 1.5--3.5 cm. lata, apice subabrupte acuminata, basi acuminata; inflorescentia axillaris, paniculata, 3.5--9 cm. longa, gracilis, glabra; pedicelli graciles, ad 7 mm. longi; sepala triangulata, ca. 1 mm. longa, acuta; petala anguste lanceolato-triangulata, ca. 5.5 mm. longa, apice attenuata, intus villosa; stamina ca. 3 mm. longa; filamenta ca. 1.7 mm. longa; antherae lanceolato-ovatae, acutae, ca. 2.2 mm. longae, nigropunctatae; ovarium glabrum; ovula parva, ca. 7.

Mexico: Chiapas, Municipio of Cintalapa, Montane Rain Forest between Colonia Francisco I. Madero and Colonia A. Lopez Mateos, elev. 1250 m., Dec. 31, 1980, D. E. Breedlove 49040 (holotype, Calif. Acad.; fragment & xerox, LL), tree, 20 feet tall, flowers pink.

The inflorescence appears to be terminal, but the small panicles are in the axils of leaves, the apical ones reduced. The anthers, subequaling the filaments, are erect and dorsally punctate with black glands. The petals are short villous within over entire surface except at base.

PARATHESIS NAVARRETEI Lundell, sp. nov. -- Frutex, 1.5--2 m.; ramuli crassi, glabrati; folia magna, glabra, longe petiolata, petiolo ad 3.5 cm. longo; lamina membranacea, ad 30 cm. longa, 10 cm. lata, subintegra, apice subabrupte acuminata, basi cuneata vel acuminata; inflorescentia axillaris, paniculata, parva, ad 10 cm. longa, pedunculata, puberula; flores corymbosi; pedicelli 2.5--4 mm. longi; sepala anguste lineari-triangulata, ad 1.5 mm. longa, obtusiuscula; petala lineari-lanceolata, ca. 5 mm. longa, aurantiaco-lineata, intus villosa; filamenta glabra, ca. 2 mm. longa; antherae lineari-lanceolatae, ca. 1.5 mm. longae, obtusiusculae, minute paucipunctatae; ovarium glabrum; ovula 7.

Mexico: Veracruz, Municipio Hidalgotitlan, orillas del Rio Las Cuevas, elev. 130 m., March 17, 1982, Tom Wendt, A. Villalobos C. & I. Navarrete 3726 (holotype, LL), hierba de 1.5--2 m. de alto, flores blancas, frutos rojos, dulces.

In leaf size, form and pubescence, P. Navarretei is similar to P. Wendtii Lundell, but the flowers of the two are quite different. In P. Navarretei the petals are much shorter,

about 5 mm. long, the filaments short and glabrous, and the oblongish anthers are obtusish, not cuspidate, with the small black dorsal glands inconspicuous. Both species have flowers similar to *P. Oerstediana* Mez, to which they are related, but the latter has short tomentose indument consisting of reddish branched, matted hairs. The other two species are minutely puberulent to glabrous.

PARATHESIS NEEI Lundell, *Wrightia* 7: 247. 1983.

Tree 4--8 m. high; branchlets thickish, tomentose with reddish stalked stellate and dendroid trichomes; leaves large, petiolate, the petioles thick, marginate, 1.5--2 cm. long, glabrous above, tomentose beneath; leaf blades membranaceous at first, becoming chartaceous to subcoriaceous in fruit, glabrous above, pubescent beneath with stellate trichomes, these dense along midvein and lateral veins, elliptic, 12--30 cm. long, 5--12 cm. wide, apex abruptly acuminate to caudate-acuminate, base subcuneate and decurrent on the marginate petiole, margin inconspicuously crenulate to subentire; inflorescences terminal, paniculate, pyramidal, up to 20 cm. long, 15 cm. wide at base, sometimes smaller, tomentose with reddish stellate trichomes; flowers corymbose, with pedicels 2--3 mm. long; sepals narrowly triangular, 1.5--2 mm. long, acuminate; petals small, linear-lanceolate, 3.5--4 mm. long, the margin and apex villous within, otherwise glabrous; stamens about 2.5 mm. long, with short filaments; anthers elliptic-lanceolate, about 2 mm. long, dorsally punctate with large black gland extending almost to apex; ovary apparently glabrous; fruit (immature) subglobose, red.

Mexico: Veracruz, Municipio Minatitlan, about 1 km. NO of Pob. 15 Nuevo, on the road to Cerro Blanco and Pob. 12, elev. 170 m., May 14, 1983, Tom Wendt, A. Villalobos C., & I. Navarrete 4066 (LL), tree of 4--8 m., petals white, fruits reddish.

This is the first flowering collection of this fine taxon. Additional collections of the species are: M. Nee & G. Schatz 19872 (holotype, F; isotype, Xal), Nee & Schatz 19926 (paratypes, F, Xal), and A. Gomez-Pompa, W. Marquez, J. I. Calzada 5486 (Xal), all collected in the Catemaco region of Veracruz.

PARATHESIS NIGROPUNCTATA Lundell, sp. nov. -- Arbor parva, ad 2 m. alta, ramulis gracilibus, minute tomentellis; folia parva, petiolata, petiolo 4--9 mm. longo; lamina membranacea, minute et dense nigropunctata, anguste oblongo-lanceolata vel oblongo-elliptica, 4.5--10 cm. longa, 1.2--3 cm. lata, integra vel subintegra, apice acuminata, subcaudata, basi anguste cuneata; inflorescentia axillaris, parva, paniculata, pedunculata, minute pubescentia, glabrata, ad 5 cm. longa; flores corymbosi; pedicelli 2.5--5 mm. longi; sepala parva, anguste triangularia, 1--1.2 mm. longa, acuta; petala anguste

lanceolata, ca. 3.5 mm. longa, punctata, intus villosa; stamina ca. 2.4 mm. longa; filamenta ca. 1 mm. longa; antherae lanceolatae, ca. 1.5 mm. longae, epunctatae vel raro minute 1-punctatae; ovarium glabrum; ovula 5.

Mexico: Chiapas, Mun. Jaltenango, al NW de la Reserva del Triunfo, en el Cerro del Filo, alt. 1980 m., bosque de Quercus con Matudaea, Nov. 5, 1982, J. I. Calzada, G. Garcia & G. Juarez 8782 (holotype, LL), arbol, 2 m.

Growing in cold humid mountainous terrain, P. nigro-punctata appears to have affinity to P. Breedlovei Lundell, also of Chiapas. It differs in various features, but notably in its leaves densely black punctate mostly with minute linear glands while leaves of P. Breedlovei are pellucid-punctate. The epunctate or rarely and minutely 1-punctate lanceolate anthers and glabrous ovary tapering into a corkscrew style are among the other differences. Both species have small very slender branched inflorescences which appear terminal but are in leafy axillary panicles.

PARATHESIS OAXACANA Lundell, sp. nov. -- Frutex, 1--2 m., ramulis crassiusculis, minute tomentellis, glabratis; folia membranacea, supra glabra, subtus glabrata, petiolata, petiolo 1--1.5 cm. longo, canaliculato; lamina dense pellucido-punctata, oblongo-elliptica, 10--17 cm. longa, 3.5--6 cm. lata, apice acuminata, basi acuminata vel attenuata, integra vel subintegra, subtus venosa; inflorescentia terminalis, minute tomentella, parva, ca. 9 cm. longa, anguste paniculata; flores corymbosi; pedicelli crassiusculi, ad 3 mm. longi; sepala triangulara, ca. 1 mm. longa, acuminata; petala lineari-lanceolata, ca. 5 mm. longa, attenuata, margine intus villosa; stamina erecta, ca. 2.7 mm. longa; filamenta crassa, ca. 1 mm. longa; antherae lanceolatae, ca. 2 mm. longae, dorso glandulosae; ovarium glabrum; ovula 6, parva.

Mexico: Oaxaca, Municipio Maria Chimalapa, 10 km. al SE de Las Juntas (union de Rios Cargamonedá y Gigante) en camino a Chicomazatlan y Cienega de Leon, Chiapas, muy cerca de la linea con Chiapas; sierra con bosque seco de pino, alt. 1000 m., May 26, 1983, T. Wendt, A. Villalobos, I. Navarrete 4147 (holotype, LL), arbusto 1--2 m.; petalos rosados, estambres amarillos.

P. oaxacana has the inflorescence type, short pedicels, small calyx and anthers punctate with large thick gland covering much of the dorsal surface, features typical of P. parvissima Lundell. This type of anther gland is present in several species and probably indicates an affinity of these taxa.

P. parvissima Lundell, described from Chiapas, appears to be closely related, differing in leaf form, petals about half as long, and with post anthesis elongation of rachis of corymbs to form racemes.

A collection from Veracruz, T. Wendt et al. 4086 (LL), from Municipio Minatitlan, 1 km. al NO de Poblado 13 en el Camino a Uxpanapa, elev. 130 m., May 18, 1983 has an almost identical inflorescence, similar indument, and flowers almost identical to those of P. oaxacana, but the leaves are much smaller, and only a single flower is available. The identification as P. oaxacana is tentative.

The Veracruz collection was made at a much lower altitude.

PARATHESIS PARVISSIMA Lundell, sp. nov. -- Frutex, 2 m.; ramuli crassiusculi, minute tomentelli; folia longissima, subchartacea, anguste oblanceolata, 10--23 cm. longa, 2.3--4 cm. lata, apice acuminata, basi attenuata, acuminata, integra vel subintegra, pellucido-punctata; inflorescentia terminalis, minute tomentella, anguste paniculata, 10--12 cm. longa, ad 4 cm. lata; flores parvissimi, corymbosi; pedicelli 2--4 mm. longi; sepala anguste lanceolata, ad 1 mm. longa, acuminata; petala anguste lanceolata, ca. 2.5 mm. longa, intus villosa; stamina ca. 2 mm. longa; antherae erectae, lanceolatae, ca. 1.5 mm. longae, punctatae; ovarium glabrum; ovula 3 vel 4, parva.

Mexico: Chiapas, Mun. Ocosingo, Lower Montane Rain Forest 70 km. southwest of Palenque on road to Ocosingo along the Jol Uk'um, elevation 550 m., Dec. 4, 1980, D. E. Breedlove & F. Almeda 48262 (holotype, Calif. Acad.; fragment & xerox, LL), shrub 6 feet tall.

The very slender leaves, finely veined and pellucid-punctate, the narrow terminal inflorescences, short pedicels, and minute flowers are features of note in P. parvissima. The glands of the anthers are wide and nearly as long as the anthers. The slender straight style exceeds the petals. At anthesis the flowers are corymbose but post anthesis the rachis elongates so that the fruits are in racemes. The petals are villous within only along the margins.

Another collection, Breedlove 28738 from an elevation of 1250 m. in Mun. Bochil, 7 km. northeast of Bochil along road to Simojovel, represents a variety of P. parvissima with smaller crenulate leaves and smaller inflorescences but with typical flowers.

P. oaxacana Lundell is of this complex.

PARATHESIS RUBRIFLORA Lundell, sp. nov. -- Frutex, 3 m.; ramuli crassiusculi, glabrati; folia glabra, petiolata, petiolo 1--1.5 cm. longo, canaliculato; lamina membranacea, lanceolata, 10--20 cm. longa, 3.5--6.5 cm. lata, apice acuminata, basi subcuneata, acuminata, crenato-dentata; inflorescentia terminalis, paniculata, 8--13 cm. longa, minute tomentella; flores corymbosi; pedicelli 3.5--5 mm. longi; sepala parva, anguste lanceolata, ca. 1 mm. longa, acuminata; corolla ca. 4.5 mm. longa; petala lanceolata, basi connata,

margine et apice minute villosa, basi glabra; stamina ca. 2.5 mm. longa; filamenta crassa, ca. 1 mm. longa; antherae lanceolatae, ca. 2 mm. longae, apiculatae, dorso nigropunctatae; ovarium glabrum, vel parce puberulum; ovula 4 vel 5.

Mexico: Chiapas, edge of tropical evergreen forest, km. 17 NW of Ocozocoantla on the road to Mal Paso, alt. ca. 775 m., Aug. 4, 1965, Keith Roe, Eunice Roe, & Scott Mori 883 (holotype, WIS; isotype, Dudley Herb; fragment & xerox, LL), shrub 3 m. high, flowers red.

The branchlets are essentially glabrous for the indument is scarcely visible. In leaf form the species resembles P. prionophylla Standl. of Nayarit. The leaf margin is crenate-dentate with large mostly irregular rounded teeth. The ovary appears to have a few hairs apically.

P. rubriflora is closely related to P. lanceolata Brandeg., having similar anthers and inflorescence.

PARATHESIS VIOLACEA Lundell, sp. nov. -- Frutex, 3 m.; ramuli crassiusculi, minute tomentelli; folia anguste petiolata, petiolo ad 2 cm. longo, canaliculato; lamina membranacea, dense punctata, lanceolata, 15--20 cm. longa, ad 6 cm. lata, apice subabrupte acuminata, basi acuta, supra glabra, subtus glabrata; inflorescentia lateralis, longe pedunculata, paniculata, ad 20 cm. longa, minute peradpresse tomentella, glabrata; flores corymbosi; pedicelli 5--7 mm. longi; sepala parva, punctata, lanceolata, ad 1 mm. longa, acuta; corolla ca. 5 mm. longa; petala basi connata, lanceolata, intus minute villosa, basi glabra; stamina ca. 2.5 mm. longa; filamenta crassiuscula, ca. 1 mm. longa; antherae ovatae vel lanceolatae, ca. 2 mm. longae, dorso minute nigropunctatae, raro epunctatae; ovarium apice stellatum; ovula parva, 6, 7.

Mexico: Chiapas, along road between Motozintla de Mendoza and Siltepec, 25.8 miles N of Motozintla, 9 miles south of Siltepec, primary cloud forest, 1300 m., Feb. 12, 1979, Thomas B. Croat 47392 (holotype, LL), shrub, 3 m., flowers reddish-violet, fruits red to purple.

The indument is sparse and consists of minute stellate hairs mostly appressed and inconspicuous. The lower surface of leaves becomes glabrous early. The leaf margin is essentially entire. Pubescence of apex of ovary and basal two-thirds of style consists of minute stellate hairs.

Referable to Section II, Series 16--23 of my monograph, P. violacea appears to have affinity to P. aurantiaca Lundell of El Salvador, which has orange glands in all parts. P. violacea differs in this particularly and in other features of the flowers and vegetative parts.

UPDATE ON THE GENUS JAEGERIA (COMPOSITAE-HELIANTHEAE)

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Abstract

Investigation of Jaegeria glabra and immediate relatives revealed that J. purpurascens (treated as a synonym of J. glabra by Torres in his revisional study of 1968) is a well-marked regional species and that J. glabra is divisible into several regional or populational varieties, two of which are described as new. In establishing these changes an overall up-date of the genus was attempted resulting in the recognition of 10 species. A key to all of the taxa is provided and up-dated distribution maps are provided for selected species.

The present study was occasioned by my attempts to recognize several recent collections forwarded to me for identification by Dr. Guy Nesom. One of these appeared, upon casual inspection, to be an undescribed species related to Jaegeria glabra. Because of its consistently small head-size, it would not key to the latter taxon in Torres (1968) revision of the genus. In spite of yet other morphological differences, I was reluctant to describe this collection as new without a careful reevaluation of the entire complex centering about J. glabra. To this end I borrowed material from several herbaria which were studied earlier by Torres; in addition, collections from several herbaria not studied by him were also examined.

The results are presented below. In short, my investigation revealed that J. glabra, as treated by Torres, has within it a well-marked taxon, previously described as J. purpurascens. Additionally, J. glabra, with the latter elements removed, is divisible into three varietal taxa: the var. glabra confined to the Sierra Madre of western Chihuahua; var. australis of south-central Mexico; and var. nana, a dwarf taxon, populationally distinct but apparently too close to the var. glabra to justify specific status. As already noted, material referred here to var. nana was the stimulus for the present study.

Since Torres' revisional study McVaugh (1972) has added an additional species (Jaegeria sterilis) to the genus, a rather remarkable taxon with sterile ray florets which I take to be close to J. pedunculata; McVaugh also suggested such a relationship. Both Jaegeria sterilis and J. pedunculata are in turn related to J. gracilis Hook. f. (including J. crassa Torres) of the Galapagos Islands. The latter, in particular, possessing the convex, striate, very thick and tough phyllaries and similarly built outer paleae (Torres, 1968) of J. sterilis. While Cronquist (1971), in his treatment of the Compositae of the

Galapagos, accepts both J. gracilis and J. crassa as "good" species I am inclined to treat these two taxa as but the ends of a variable group of populations, largely since Torres (1968, p. 71) refers to the existence of transitional forms between the two, and my own experience with the variation extremes found in the Galapagoan populations of Chrysanthellum pusillum Hook. f. (Turner, in mss.).

Turner (1980), in his revisional study of Aphanactis, transferred one other species, Jaegeria standleyi, into the genus from Aphanactis. Specimens of this taxon were not examined by Torres, but these clearly belong to Jaegeria, close to, if not conspecific, with J. hirta.

Overall, Torres recognized 8 species of Jaegeria and no varieties. The present "update" recognizes 10 species: 3 recognized since his treatment (J. sterilis, J. standleyi and J. purpurascens) and 1 submergence (J. crassa) of the Galapagos Islands into J. gracilis. In addition, 3 varietal taxa are recognized within the Jaegeria glabra complex, bringing to 12 the number of taxa given nomenclatural recognition.

I am grateful to my colleague Dr. M. C. Johnston for the Latin diagnoses, and to Dr. Guy Nesom for providing a fine suite of specimens for my studies of the varieties glabra and nana. The present study was based upon material from the following herbaria (the sheets borrowed are indicated parenthetically): CAS-DS (30), GH (42), LL (20), MICH (53), NY (52), TEX (50), WISC (4).

Convenient Key to taxa of Jaegeria

1. Plants of the Galapagos Islands.....J. gracilis
1. Plants of Continental North and South America
 2. Plants of South America
 3. Involucral bracts glabrous or nearly so, dorsally convex or plano-convex; herbage glabrous or nearly so.....J. axillaris
 3. Involucral bracts densely pubescent, dorsally flattened; herbage prominently pubescent.....J. hirta
 2. Plants of North America
 4. Annuals with erect stems or acaulescent (forming rosettes); rays pale yellow, the ligules 0.5-1.5 mm long
 5. Plants acaulescent, the leaves rosulate.....J. standleyi
 5. Plants with definite stems, the leaves not rosulate.....J. hirta
 4. Plants not as above
 6. Leaf blades glabrous; petioles 5-30 mm long; dorsal portion of the involucral bracts (alae) glabrous, including the dorsal margins.....J. glabra
 7. Blade length/width ratio 1.5-2.5;

- plants of south-central Mexico.....b. var. australis
7. Blade length/width ratio 3.5-6.5; plants of north-central Mexico (Chihuahua).
8. Ligules of ray 5-10 mm long; peduncles 4-10 cm long.....a. var. glabra
8. Ligules of ray 3-4 mm long; peduncles 1-3 cm long.....c. var. nana
6. Leaf blades glabrous or variously pubescent; petioles absent or weakly developed; dorsal portion of involucre bracts or their rounded margins decidedly pubescent
9. Involucre (pressed) 1.5-2.0 cm wide; aquatics with spongy stems 0.5-2.0 cm thick.....J. bellidiflora
9. Involucre (pressed) 0.5-1.2 cm wide; terrestrial or aquatics with stems 0.1-0.5 cm thick
10. Leaves glabrous or nearly so; rays white to rosy.....J. purpurascens
10. Leaves decidedly pubescent; rays yellow.
11. Ray florets sterile; disc florets glabrous or nearly so; annuals.....J. sterilis
11. Ray florets fertile; disc florets conspicuously pubescent; perennials (rarely + annual)
12. Blades lanceolate or essentially so, widest at or near the base.....J. pedunculata
12. Blades ovate to elliptic, widest at the middle or nearly so.....J. macrocephala

Jaegeria axillaris Blake

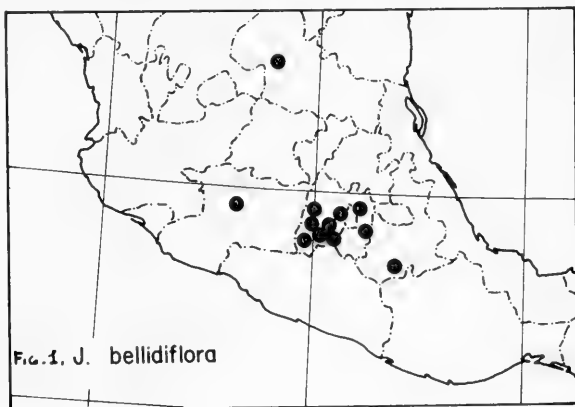
As indicated by Torres, this species of South America clearly belongs to Jaegeria. He could not relate the species to yet others in the genus but it appears to be most closely related to J. purpurascens.

Jaegeria bellidiflora (Moc. & Sesse ex DC.) Torres & Beaman.

Distribution: Fig. 1.

This species is readily distinguished by a number of features and poses no significant problems. Relatively few new collections have accrued to herbaria since Torres' study. Only a single enigmatic plant was encountered, that being Pringle 7311 (GH) from the valley of Mexico (Federal District). Torres, by penciled annotation in 1965, queried this as a possible hybrid between Jaegeria glabra and J. bellidiflora. It is possible that this plant is a hybrid derivative from such a combination, since

both species occur in the region concerned. Overall, however, it appears to be an aberrant or dwarf form of J. bellidiflora, the species of Jaegeria in general being quite plastic with respect to head size and leaf shape, especially the more aquatic taxa. Torres himself did not comment upon this collection in his revision, nor did he cite it.



Jaegeria glabra (S. Wats.) B. L. Rob.

Distribution: Fig. 5

Torres (1968) treated J. purpurascens (type near Durango City, Durango; isotype Palmer 805, NY!) as synonymous with J. glabra. He noted, however, that its type collection "...is quite different from the type of J. glabra. The chief difference is vegetative, in the shape of the leaves, and in that those of J. purpurascens are sessile while those of J. glabra are petiolate, although many specimens are more or less intermediate between them in leaf morphology. In other vegetative, and especially floral, characters the two are not separable." I personally found no difficulty in sorting out the 14 or so sheets cited below under J. purpurascens. Not only were the leaf characters noted by Torres consistent and seemingly without intermediates but, in addition, I found consistent involucre features, as noted in my key to species, which readily distinguish J. purpurascens from J. glabra.

Jaegeria glabra, itself, is readily separable into several regional or populational varieties as noted in Fig. 2. Leaf shape alone can be used to distinguish between the isolated southern populations (var. australis) and those from western Chihuahua. Fig. 2 is a scatter diagram in which leaf shapes and peduncular lengths for all of the collections examined by me were plotted. Leaf length/width ratios clearly discriminate between the varieties glabra and australis and, to some extent, peduncular

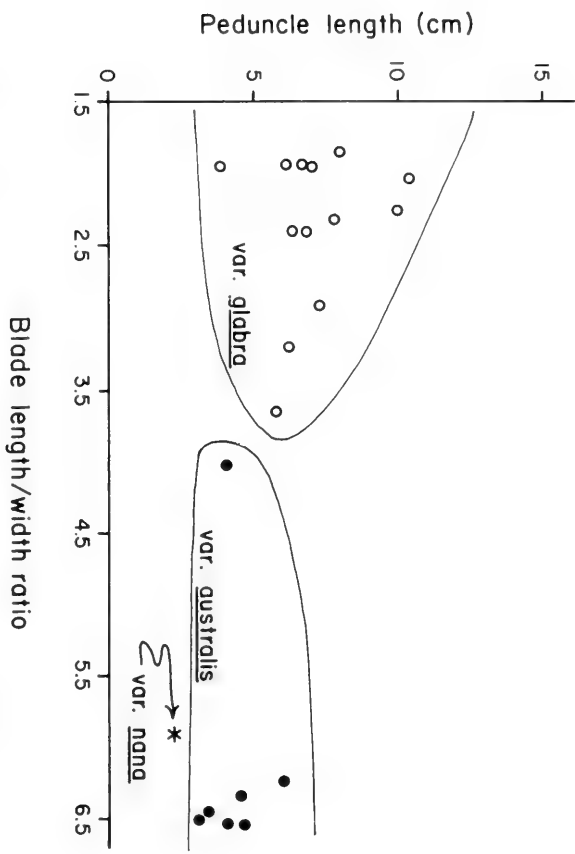


Fig. 2. Scatter diagram for the characters separating varieties of *J. glabra*

length. The var. nana is essentially like var. glabra except that the peduncles, heads and ray florets are smaller.

a. var. glabra

In addition to the sheets annotated by Torres (1968), I have examined the following specimens collected since that time: CHIHUAHUA. Bye 3161 (GH); Bye 9869 (TEX); Nesom 4492 (TEX).

b. var. australis B.L. Turner, var. nov.

A var. glabra foliis amplioribus pedunculis longioribus differt.

Distribution: Fig. 5

TYPE: MEXICO. Michoacan: In large llano ca. 4 Km SW of Cerro San Andres, ca. 10 Km (straight line distance) N of Ciudad Hidalgo; ca. 2930 m; "in small stream, forming a large colony", 6 Sep 1960, Beaman 4245 (holotype TEX!; isotypes GH!, MSC, TEX!).

In addition to the sheets from south-central Mexico annotated by Torres (1968), I have examined the following specimens available since that time: MEXICO STATE: Cruz 1040 (MICH, TEX, WISC); Quintero 1111 (MICH, TEX); Rzedowski 19414 (TEX) Torres (1968, Fig. 3) has a sketch made from type material.

c. var. nana, var. nov., B. L. Turner

A var. glabra habitibus nanis, partibus omnibus parvioribus differt.

TYPE: MEXICO. Chihuahua: 5 Km NE El Vergel along highway 24 towards Parral. Abundant in water of roadside ditches and permanent pools, pine-oak-madrone forests, 9000 ft, 21 Aug 1981, Nesom 4472 (holotype TEX!; isotypes, MEXU, MICH, NY, etc.).

The variety is, morphologically, relatively uniform. Among the 40 or more seemingly separate collections which I examined, most had separate fibrous root systems, developing only very short stolons (1-2 cm), as though the plants were annual. Additional study may show the taxon to be specifically distinct but on present evidence it appears to be a genetically-mediated dwarf population, in nearly all characters qualitatively like the var. glabra.

Jaegeria gracilis Hook. f. (including J. crassa Torres)

As noted in the introduction to this paper I recognize but one variable species native to the Galapagos Islands. Torres segregated individuals with clasping, indurate outer pales as J. crassa. Such individuals occur in close proximity with individuals identifiable as J. gracilis (e.g. Tagus Cove Mountain, Albemarle Island, Howell 9551A and 9567, 26 May 1932, CAS) and, according to Cronquist (1980), are closely sympatric on at least 3 of the Galapagos Islands (Albemarle, Santa Cruz and San Cristobal). Along with the fact that intermediates occur, I

accept the possible explanation offered by Torres that the two taxa recognized by him are but the extremes of a single species.

After the above was written I chanced upon an article on Galapagoan plants by van der Werff (1977) who essentially validates the synonymy of *J. crassa* with *J. gracilis*, as expressed above.

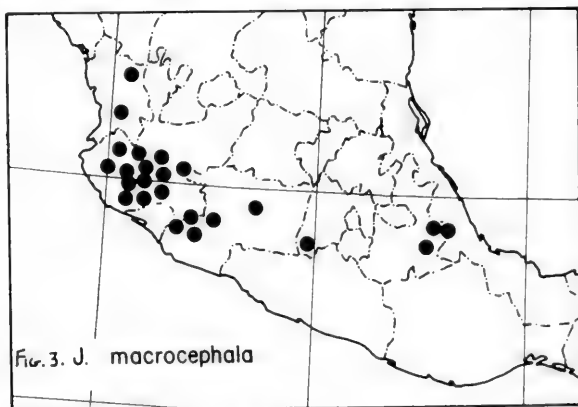
Jaegeria hirta (Lag.) Less.

This exceedingly widespread variable species is easily recognized by its strictly erect habit, very short yellowish rays and numerous small heads on relatively short peduncles. Since it is sympatric with nearly all of the other continental species it would not be surprising to find the occasional hybrid. One such plant is Lot 1187 (GH) from Veracruz which is possibly a hybrid or hybrid derivative of *J. macrocephala* x *J. hirta*. The plant concerned is clearly procumbent but possesses relatively small heads, with short rays, on delicate short peduncles.

Jaegeria macrocephala Less.

Distribution: Fig. 3

My interpretation of this species is essentially that of Torres (1968). It is quite variable both in habit and leaf size but is readily distinguished by its relatively broad, subsessile, blades which are nearly always broadest at the middle.



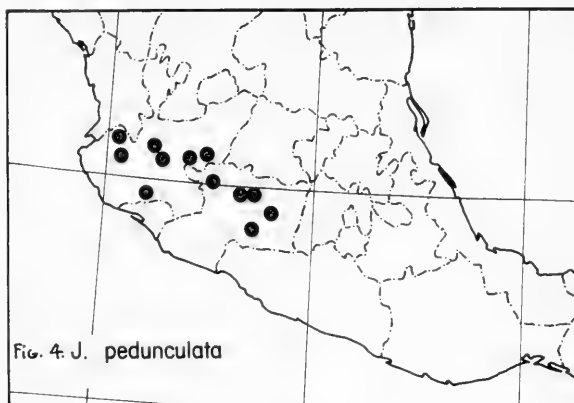
Jaegeria pedunculata Hook. & Arn.

Distribution: Fig. 4

My interpretation of this species is essentially that of Torres (1968). It is relatively close to *J. macrocephala* and occasional specimens appear to approach that species (e.g., King 3670, from Nayarit).

Jaegeria purpurascens B. L. Rob.

Distribution: Fig. 5



As noted under Jaegeria glabra, above, J. purpurascens was not recognized by Torres. However, the taxon is clearly distinct, both vegetatively and by technical characters of the head.

In addition to the type material (Durango: Palmer 805, NY!, US), the following specimens were examined (those indicated by an * were annotated by Torres as J. glabra): DURANGO: Breedlove 18730 (CAS-DS, MICH); Cronquist 9578* (GH, MICH, NY, TEX). GUANAJUATO: McVaugh 24076 (MICH). JALISCO: Dieterle 3553 (LL, MICH); McVaugh 17566* (CAS-DS, MICH, NY, TEX); McVaugh 24370 (MICH).

It should be noted that the Jalisco and Guanajuato specimens of this taxon, while possessing sessile leaves and pubescent involucre bracts, have a different habitus aspect, being more erect with a tendency to form whorled reduced leaves at its lower nodes. Additional study may suggest nomenclatural status.

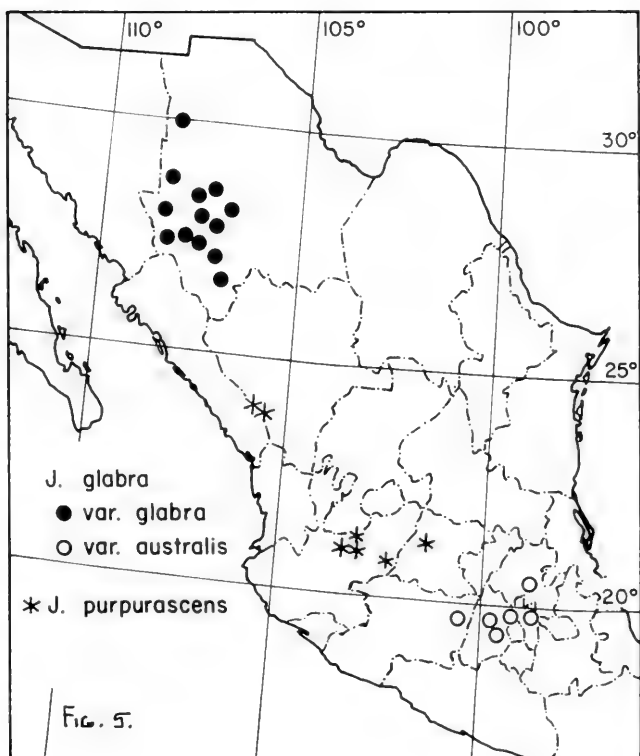
Jaegeria standleyi (Steyermark) Turner

This species, first described by Steyermark in 1940 as Aphanactis standleyi, was not accounted for by Torres (1976). As noted by Turner (1980), it is very closely related to J. hirta and is perhaps an acaulescent timberline element derived out of that variable complex.

LITERATURE CITED

- Cronquist, A. 1971. Compositae. In Wiggins, I. L. and D. M. Porter, Flora of the Galapagos Islands. Stanford Univ. Press, Stanford.

- McVaugh, R. 1972. *Compositarum Mexicanarum Pugillus*. Contr. Univ. Michigan Herb. 9:359-484.
- Torres, A. M. 1968. Revision of *Jaegeria* (Compositae-Heliantheae). *Brittonia* 20:52-73.
- Turner, B. L. 1980. La taxonomia del genero *Aphanactis* (Astereae-Heliantheae). *Bol. Soc. Argentina Bot.* 19:33-44.
- van der Werff, H. 1977. Vascular plants from the Galapagos Islands: new records and taxonomic notes. *Bot. Notiser* 30:89-100.



A NEW RECORD FOR SCHIZACHYRIUM SEMITECTUM IN MEXICO

John R. Reeder

Herbarium, University of Arizona, Tucson 85721

In December, 1983, Paul S. Martin of the Geosciences Dept. at the University of Arizona, collected a small grass in southern Sonora, Mexico. The plants, which came to us for determination, proved to be Andropogon semitectus Swallen, otherwise known in western Mexico only from a Pringle collection made near Guadalajara, Jalisco, in 1893. The Pringle material was referred to Andropogon malacostachyus Presl [= Schizachyrium malacostachyum (Presl) Nash] by A. S. Hitchcock (Contr. U. S. Nat. Herb. 17: 202. 1913). Recently McVaugh (Flora Novo-Galiciana 14: 352. 1983) has pointed out that the characteristics of the Pringle specimen match much better A. semitectus. McVaugh's treatment is, however, somewhat confusing. Alphabetically among the species of Schizachyrium is listed "Andropogon semitectus Swallen." There is an ample description, but no transfer is made. In fact, it is unclear whether or not the author has accepted it! Following the description, he notes that the taxon may not be sufficiently distinct from Schizachyrium malacostachyum, with which Swallen compared it. Nevertheless, at the end of McVaugh's treatment S. malacostachyum is listed under "doubtful and excluded species."

The Martin collection, the largest plant of which measures 27 cm in height, certainly has the features of Andropogon semitectus, a taxon I am inclined to accept as specifically distinct. It has the long hairs on the adaxial leaf surface, a ligule 0.5 mm or less long, spikelets 5—6 mm long, the pedicellate spikelet (rudiment) is very small, and the pedicel, rachis joint, and 1st glume of the sessile spikelet are densely villous on the lower half. It is clearly a member of the segregate genus Schizachyrium, and since the appropriate combination has not been made, I offer it below:

SCHIZACHYRIUM SEMITECTUM (Swallen) J. Reeder, comb. nov.

Andropogon semitectus Swallen, Contr. U. S. Nat. Herb. 29: 427. 1950. Type: Guatemala, Dept. Zacapa, Standley 73919 (US).

The complete data for the Martin collection are:
Mexico: Sonora, ca. 32 km east of Yaqui Crossing at Tonichi, along new road to Yecora. Growing in hydrothermically altered soil. Elev. 850 m. Coll. Paul S. Martin (sine no.) 20 Dec 1983. The specimen is deposited at ARIZ.

OBSERVATIONS ON THE FLORAL STRUCTURE OF DYSSODIA
TENUILOBA (DC.) B. L. ROBINSON AND MATRICARIA
MATRICARIOIDES (LESS.) T. C. PORTER (ASTERACEAE).

K. N. Gandhi and R. Dale Thomas, The Herbarium,
Department of Biology, Northeast Louisiana University,
Monroe, La. 71209.

A study made by the authors on the specimens of Dyssodia tenuiloba (DC.) B. L. Robinson and Matricaria matricarioides (Less.) T. C. Porter in the NLU Herbarium revealed some interesting morphological features.

With reference to Dyssodia, the pappus is unique and its description has varied from author to author. Small (1933) described the pappus as "... of 10 or more partly united narrow scales" in Boebera papposa (Vent.) Rydb. (= D. papposa). He did not describe the pappus in Thymophylla tenuiloba (DC.) Small (= D. tenuiloba). Fernald (1952) described the pappus as "a row of chaffy scales, dissected into numerous rough bristles." Strother (1969) in his monograph on the genus described the various forms of pappus in Dyssodia as follows: "... the pappus is relatively uniform, consisting of 15 to 20 squamellae, each dissected into several tawny bristles.... the outer series of squamellae is often reduced to a few erose, truncate scales.... may have several merely aristate scales, five aristate scales alternating with five erose ones, or all the squamellae awnless and erose. In one taxon... the truncate scales are connate and form a shallow cup." Correll and Johnston (1970) described the pappus as "of 5 to 22 squamellae, muticous, 2-awned or dissected into several bristles; frequently both muticous and awned scales on the same achene." Cronquist (1980) said the pappus is "of 5-28 scales in 1-2 series, these sometimes (as in our spp.) cleft to below the middle into several bristles."

The following observations were made on the developmental sequence of the pappus in D. tenuiloba by Gandhi and Thomas: in the early stages, each segment of the pappus possesses a flat, short base and a long, dentate awn; in further development, at the base of the awn a lateral rudimentary outgrowth is seen on each side; each such lateral growth extends as a secondary awn but hardly reaching 3/4 of the main awn; very often these lateral awns become segmented. This study advocates that these lateral awns do not split from the main awn but arise independently as illustrated in figure 1.

In Matricaria matricarioides, the disk corolla is generally described as 4-toothed (see Fernald (1952) and Cronquist (1980)). Although the above description is for typical flowers, the following observations were observed by the authors: the corolla mostly was 4-toothed but occasionally bore 5 teeth; further most of the corollas (in our specimens) were sheathed by a structure simulating a 'corolla.' This additional 'outer corolla' is 4- or 5-toothed, and is slightly constricted below the teeth. The basal part of this 'sheathing corolla' is dilated; hence, the actual corolla appears as winged. The tubular part of the actual corolla is free from the 'sheathing corolla'; however, the teeth of both the 'sheathing corolla' and the actual corolla are connivent as illustrated in figure 2.

LITERATURE CITED

- Correll, D. S. and M. C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner. 1881 pp.
- Cronquist, Arthur. 1980. Vascular flora of the southeastern United States, Vol. I: Asteraceae. The University of North Carolina Press, Chapel Hill. 261 pp.
- Fernald, M. L. 1950. Gray's manual of botany, eighth edition. American Book Company, New York. 1632 pp.
- Small, John Kunkel. 1933. Manual of the southeastern flora. University of North Carolina Press, Chapel Hill. 1554 pp.
- Strother, John L. 1969. Systematics of Dyssodia Cavanilles (Compositae: Tageteae). University of California Publications in Botany 48: 1-88.

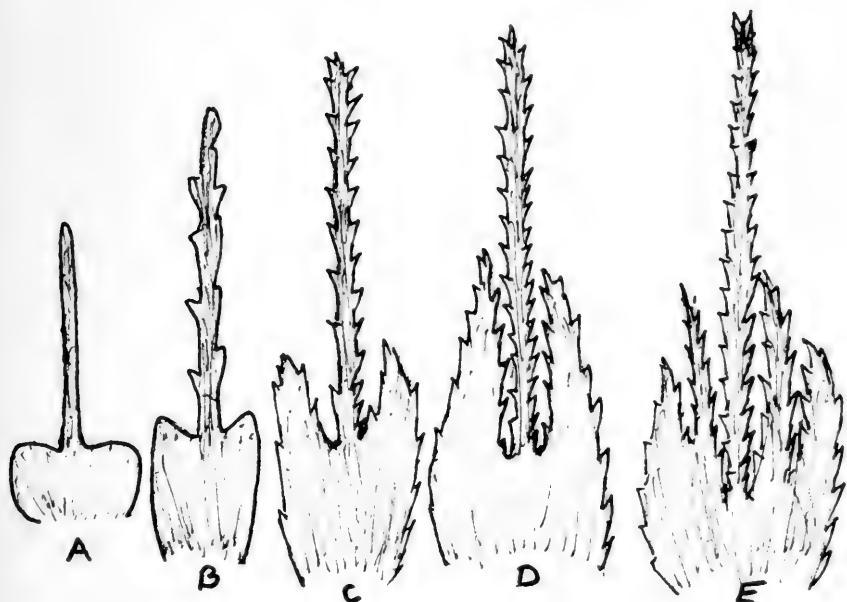


Figure 1: *Dyssodia tepuiloba*: A-E: Developmental sequence of pappus scale.

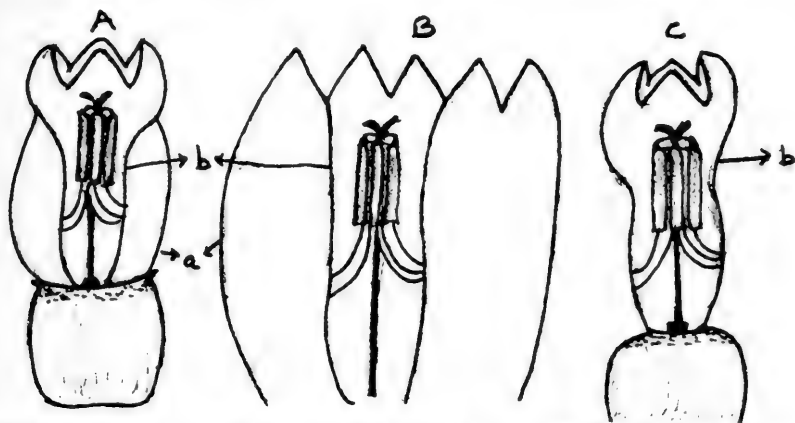


Figure 2: *Matricaria matricarioides*: A, Complete flower; B, Sheathing corolla spread out (note the 5 teeth); C, flower without sheathing corolla. a. sheathing corolla; b. true corolla.

PANICUM CAPILLARE L. VAR. BARBIPULVINATUM (NASH) COMB. NOV.

Ronald L. McGregor
University of Kansas Herbarium
2045 Constant Ave., Lawrence, KS 66046

Panicum capillare L. var. barbipulvinatum (Nash) R.L. McGregor, comb. nov., based on P. barbipulvinatum Nash, Mem. N.Y. Bot. Gard. 1: 21. 1900 and the autonymic var. barbipulvinatum established by Panicum barbipulvinatum var. hirsutipes Suksdorf, Werdenda 1: 17. 1927.

While studying the variation of Panicum capillare s.l. it became clear that three taxa could be recognized. Since all three are now somewhat sympatric I prefer to use the rank of variety, rather than subspecies, for the taxa. P. c. var. capillare is automatic for one variety and P. c. var. brevifolium Vasey ex Rydberg & Shear must replace the illegitimate P. c. var. occidentale Rydb. (McGregor, 1984) for another variant. The most distinctive variety, however, required the above new combination and follows enactment of the "Demoulin" rule at the Sydney Congress.

I submit the following key to the three varieties which does not consider the possibility that P. gattingeri Nash may be a variety of P. capillare L.

- 1 Mature spikelets 1.8-2.2(2.3) mm long; plants of SE U.S., introduced elsewhere.....1. P. c. var. capillare
- 1 Mature spikelets (2.4)2.5-4.5 mm long; plants of W 1/2 and N U.S., introduced elsewhere.
 - 2 Spikelets (2.4)2.5-2.9(3.1) mm long; mature fruit 1.5X as long as wide; general distribution.....2. P. c. var. brevifolium
 - 2 Spikelets 3.0-4.0(4.5) mm long; mature fruit 2X as long as wide; sandy shores and moist places.....3. P. c. var. barbipulvinatum

LITERATURE CITED

- McGregor, Ronald L. 1984. Panicum capillare L. var. occidentale Rydb. (Poaceae): an illegitimate name. Contrib. Univ. Kansas Herbarium 10: 1-3.

ADDITIONAL NOTES ON THE *ERIOCAULACEAE*. XCVIII

Harold N. Moldenke

SYNGONANTHUS PROLIFER Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 26--27. 1977; Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 167 & 625. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77. 1980.

Recent collectors describe this species as a slender herb, 10--20 cm. tall, the leaves pale- or mid-green, the "stems" [peduncles] mid-green, the heads "pale-fawn", the involucre bractlets pale-brown or whitish-straw, and the florets whitish. They have found it growing in a region of "sandstone rocks with open sand in flatter areas, open scrub in exposed sites with scattered low woodland in shelter of rocks", in an area of "sandstone, metamorphic and quartzite rock outcrops with associated marsh and damp flushes", and in a region of "waterworn horizontally bedded sandstone at soil surface, with damp sand, sedge marsh, exposed rock and waterfalls, the vegetation consisting of open scrub to closed low woodland in drier areas", at 900--1500 m. altitude, in both flower and fruit in February and March.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19258 (Ld, N), 19325 (Ld, N), 19554 (Ld, N); Mattos Silva & Brito 955 (Ld). Minas Gerais: W. R. Anderson 8940 (W--2755401). MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 374--375, pl. 238. 1928 (Ld, N, W).

SYNGONANTHUS PROLIFER var. *PARVUS* Mold.

Additional bibliography: Mold., *Phytologia* 38: 27. 1977; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

SYNGONANTHUS PTEROPHYLLUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 28. 1977; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 379--380, pl. 241. 1928 (Ld, N, W).

SYNGONANTHUS PULCHELLUS Mold.

Additional bibliography: Mold., *Phytologia* 42: 204. 1979; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35843 (W--2709885--isotype). MOUNTED ILLUSTRATIONS: Mold., *Phytologia* 27: 72, fig. 4. 1973 (Ld).

SYNGONANTHUS PULCHER (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 28--29 & 43. 1977; Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

Additional citations: BRAZIL: Minas Gerais: *G. Gardner* 5265 (W--1067053--isotype). MOUNTED CLIPPINGS: Krn. in Mart., Fl. Bras. 3 (1): 452. 1863 (N, W).

SYNGONANTHUS PULVINELLUS Mold.

Additional bibliography: Mold., *Phytologia* 38: 29. 1977; Angely, *S. Amer. Bot. Bibl.* 2: 675. 1980; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

SYNGONANTHUS QUADRANGULARIS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 29. 1977; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 333--334, pl. 210. 1928 (Ld, N, W).

SYNGONANTHUS RECLINATUS (Krn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 29--30. 1977; Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 167 & 625. 1980.

Additional citations: BRAZIL: Gois: *Duarte* 13954 [Herb. Brad. 60826] (Ld); *G. Gardner* 3488 (W--936281--isotype).

SYNGONANTHUS REFLEXUS Gleason

Additional bibliography: Mold., *Phytologia* 42: 204--205 (1979) and 46: 155. 1980; Mold., *Phytol. Mem.* 2: 112, 120, 168, & 625. 1980.

Recent collectors describe this plant as a very common herb, 15--40 cm. tall, the inflorescences dry, the flowering heads white, and the "flowers cream". They have found it growing on quartzite-based mesas, in very wet spots on white-sand campinas, and "frequent throughout the savannas", 35--335 m. altitude, in flower in April, and both in flower and fruit in January, February, and June to August. Huber refers to it as "common on all savannas" and as a "hierba arrosetada comn en toda la sabana anegadiza". Caldern and his associates make the remarkable assertion "plants ash-white color with golden hairy inflorescences" -- certainly an error in observation.

The Maguire, Wurdack, & Keith 41759, Mura Pires, Black, Wurdack, & Silva 6182, 6462, 6470, & 6553, and Rosa & Santos 1993, previously cited as typical *S. reflexus*, are now considered by me as representing its var. *longifolius* Mold., while Steyermark 75854 is *S. xeranthemoides* var. *tricostatus* (Gleason) Mold.

Additional citations: COLOMBIA: Guaina: *Garca-Barriga* 20833 (W--2844154); Maguire, Wurdack, & Keith 41845 (W--2279329). Vaups: *Schultes*, *Baker*, & *Cabrera* 18178 (W--2198896); *Schultes* & *Cabrera* 14229 (W--2198866), 14348 (W--2198870), 19172 (Ld, W--2198915), 19948 (W--2198931), 19990 (W--2198933). VENEZUELA: Amazonas: *Farias*, *Velasquez*, & *Medina* 450 (N); *O. Huber* 1078 (Ld), 2387 (Ld), 2418 (Ld), 2450 (Ld), 2529 (Ld), 2552 (Ve), 2644 (Ld), 2670 (Ld), 3406 (Lc), 3851 (Lc), 3875 (Lc), 3925 (Ve); *Huber* & *Medina* 5756 (Ld); *Huber* & *Tillett* 2910 (Ld), 3060 (Ld),

5458 (Ve), 5473 (Ld); Huber, Tillett, & Davidse 3658 (Ld), 3683 (Ve); Maguire & Wurdack 35655 (W--2168956); Maguire, Wurdack, & Bunting 36352 (W--2168973), 36675 (W--2168981); Maguire, Wurdack, & Maguire 41681 (W--2279300); J. A. Steyermark 57816 (W--1901738); Wurdack & Adderley 42868 (W--2320881). BRAZIL: Amazonas: Calderon, Monteiro, & Guedes 2558 (Ld, W--2931219), 2672 (Ld, W--2931233); Rosa & Lira 2281 (N).

SYNGONANTHUS REFLEXUS var. *LONGIFOLIUS* Mold., Phytologia 46: 155. 1980.

Bibliography: Mold., Phytologia 46: 155. 1980; Mold., Phytol. Mem. 2: 120, 168, & 625. 1980.

Recent collectors describe this plant as an "arbuste de 60 cm., inflorescencia branca" and report it locally abundant on scrub savannas and wet savannas, in "floresta com manchas de serrado, solo arenito e quartzito", at 120--425 m. altitude, in both flower and fruit in May, October, and December. Most of the collections cited below were previously cited by me in earlier installments of these notes as typical *S. reflexus* Gleason before the validity of the present variety was established.

Citations: VENEZUELA: Amazonas: Maguire, Wurdack, & Keith 41759 (B, B, Mu, N, S). BRAZIL: Mato Grosso: Rosa & Santos 1993 (N). Pará: Murça Pires, Black, Wurdack, & Silva 6182 (N), 6462 (N--type), 6470 (N), 6553 (N).

SYNGONANTHUS RETRORSO-CILIATUS Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 31--32. 1977; Mold., Phytol. Mem. 2: 168 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 347--349, pl. 220. 1928 (Ld, N, W).

SYNGONANTHUS RETRORSUS Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 32. 1977; Mold., Phytol. Mem. 2: 168 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 344--345, pl. 218. 1928 (Ld, N, W).

SYNGONANTHUS RHIZONEMA Ruhl.

Additional bibliography: Mold., Phytologia 38: 32--33 & 43. 1977; Mold., Phytol. Mem. 2: 168 & 625. 1980.

SYNGONANTHUS RIVULARIS Mold.

Additional bibliography: Mold., Phytologia 38: 33 & 48. 1977; Mold., Phytol. Mem. 2: 120 & 625. 1980.

Huber and Tillett encountered this plant on savannas, growing with their no. 5573 at 100 m. altitude, in both flower and fruit in July.

Additional citations: VENEZUELA: Amazonas: Huber & Tillett 5573a (Ve). Bolívar: Steyermark & Wurdack 792 (W--2168524--isotype, W--2407796--isotype).

SYNGONANTHUS ROBINSONII Mold.

Additional bibliography: Mold., *Phytologia* 38: 33--34. 1977; Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 228, 236, & 625. 1980.

SYNGONANTHUS RUFIPES Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 34. 1977; Mold., *Phytol. Mem.* 2: 168 & 625. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 388, pl. 247. 1928 (Ld, N, W).

SYNGONANTHUS RUFO-ALBUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 34--35. 1977; Mold., *Phytol. Mem.* 2: 168, 444, & 625. 1980.

SYNGONANTHUS RUPRECHTIANUS (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 35 & 126. 1977; Mold., *Biol. Abstr.* 65: 3719. 1978; Mold., *Phytol. Mem.* 2: 168, 398, 427, & 625. 1980.

SYNGONANTHUS SAVANNARUM Mold. & *S. SAVANNARUM* var. *GLABRESCENS* Mold.

These taxa are now classified as *Paepalanthus savannarum* (Mold.) Mold. and *P. savannarum* var. *glabrescens* (Mold.) Mold., which see.

SYNGONANTHUS SCHLECHTERI Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 33, 37, & 132. 1977; Mold., *Phytol. Mem.* 2: 221 & 625. 1980.

SYNGONANTHUS SCHWACKEI Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 37--39. 1977; Mold., *Phytol. Mem.* 2: 168 & 625. 1980.

SYNGONANTHUS SCLEROPHYLLUS Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 38. 1977; Mold., *Phytol. Mem.* 2: 168 & 625. 1980.

SYNGONANTHUS SICKII Mold.

Additional bibliography: Mold., *Phytologia* 38: 38. 1977; Mold., *Phytol. Mem.* 2: 168 & 625. 1980.

SYNGONANTHUS SIMILIS Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 38--39. 1977; Mold., *Phytol. Mem.* 2: 120, 168, & 625. 1980.

SYNGONANTHUS SIMILIS var. *VENEZUELENSIS* Mold., *Phytologia* 45: 209. 1980.

Bibliography: Mold., *Phytologia* 45: 209. 1980; Mold., *Phytol. Mem.* 2: 120 & 625. 1980.

Huber describes this as an herb, 20--30 cm. tall, with the "ex-

ternal floral bracts" [involucral bracts] "marrón doradas", the flowers white. He encountered it on open savannas, where he reports it frequent, and on wet savannas with hummocks "por debajo de morichal", at 95--98 m. altitude, in flower in February and both in flower and fruit in May.

Citations: VENEZUELA: Amazonas: O. Huber 1633 (Ld--type), 1905 (Ld), 3359 (Ve).

SYNGONANTHUS SIMPLEX (Miq.) Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Mold., Phytologia 38: 39--42. 1977; Mold., Biol. Abstr. 65: 3719. 1978; Mold., Phytologia 42: 38 & 43. 1979; Mold., Phytol. Mem. 2: 112, 120, 123, 125, 168, & 625. 1980; Mold., Phytologia 54: 235. 1983.

Knuth (1927) cites *Passarge & Selwyn 580* from Bolívar and *Connell & Quelch 126* from Roraima, Venezuela.

Recent collectors have found the plant on wet and inundated savannas, "rather frequent", at 50 m. altitude, describing the inflorescence heads as white, in both flower and fruit in September and November.

Additional citations: COLOMBIA: Vaupés: *Schultes & Cabrera 12381* (W--2198862), *13505* (W--2198882), *14963* (W--2198876), *19936* (W--2198930). VENEZUELA: Amazonas: *Maguire & Politi 28035* (W--2046451); *Maguire, Wurdack, & Keith 41793* (W--2279322); *Thomas & Rogers 2615* (N). Bolívar: *Huber, Alarcon, & Davidse 6816* (Ld). Guárico: *Delascio, Montes, Mesa, & Arismandi 10228* (W--2937050). GUYANA: *Maguire & Fanshawe 23206a* (W--1907822).

SYNGONANTHUS SIMPLEX var. *APPENDICULIFER* Ruhl.

Additional bibliography: Mold., Phytologia 38: 42. 1977; Mold., Phytol. Mem. 2: 123, 168, & 625. 1980.

SYNGONANTHUS SINUOSUS Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 42--43. 1977; Mold., Phytol. Mem. 2: 168 & 625. 1984.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Serr. Min. 75. 1908 (W); Alv. Silv., Fl. Mont. 1: 353--355, pl. 224, fig. 2. 1928 (Ld, N, W).

SYNGONANTHUS SPADICEUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 38: 43. 1977; Mold., Biol. Abstr. 65: 3719. 1978; Mold., Phytol. Mem. 2: 168 & 625. 1980.

SYNGONANTHUS SQUARROSUS Ruhl.

Additional bibliography: Mold., Phytologia 38: 31 & 43--45 (1977) and 38: 183 & 192. 1978; Mold., Biol. Abstr. 65: 3719. 1978; Mold., Phytol. Mem. 2: 168 & 625. 1980.

SYNGONANTHUS SQUARROSUS var. *ELATIOR* Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 44--45. 1977;

Mold., Phytol. Mem. 2: 168 & 625. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 396. 1928 (Ld, N, W).

SYNGONANTHUS STEYERMARKII Mold.

Additional bibliography: Mold., Phytologia 38: 45. 1977; Mold., Phytol. Mem. 2: 120 & 625. 1980.

Recent collectors describe this plant as growing in dense tufts and have encountered it at 3000--3200 m. altitude, in both flower and fruit in January.

Additional citations: VENEZUELA: Apure: *Steyermark, Dunsterville, & Dunsterville 101243* (N).

SYNGONANTHUS SURINAMENSIS Mold.

Additional bibliography: Mold., Phytologia 38: 45. 1977; Mold., Phytol. Mem. 2: 125 & 625. 1980.

Additional citations: SURINAM: B. Maguire 24321 (W--1907837), 24502 (N--type, W--1907840--isotype).

SYNGONANTHUS TENUIPES Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 45--46. 1977; Mold., Phytol. Mem. 2: 168 & 625. 1980.

Citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., Fl. Mont. 1: 326--327, pl. 207. 1928 (Ld, N, W).

SYNGONANTHUS TENUIS (H.B.K.) Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Hocking, Excerpt. Bot. A. 30. 421. 1978; Mold., Phytologia 42: 205. 1979; Mold., Phytol. Mem. 2: 112, 120, 123, 168, 442, 444, & 625. 1980; Mold., Phytologia 50: 246. 1982.

Recent collectors describe this plant as a common herb, 15--30 cm. tall, forming small colonies, often mixed with grasses and *Xyris*, with white inflorescence heads. They have encountered it in open areas of cerrado on white sand, in periodically burned cerrado and campina, on wet and sandy savannas over a quartzite base, in marshes on inundated campo, in "open treeless areas on white-sand savannas dominated by *Lagenocarpus* and *Axonopus* species interspersed with tree and shrub islands", and very abundant on "campo sujo, solo areia", at 20--255 m. altitude, in both flower and fruit in February, June, July, August, November, & December.

The vernacular name, "sempre viva", has been reported for this species -- actually, it is applied to all the Brazilian species with dry, *Xeranthemum*-like heads which are long-persistent after being picked. Steward and his associates report finding "a few heads proliferous" on their no. 74. Huber refers to the plant as "very common or even dominant all over the savannas".

Knuth (1927) cites an unnumbered Humboldt & Bonpland collection and Passarge & Selwyn 259 from Bolívar, Venezuela. The Prance, Pennington, & Murça Pires 1295 collection, cited below, is a mixture with a species of *Xyris* and a grass.

Material of *S. tenuis* has been misidentified and distributed in some herbaria as *S. gracilis* (Körn.) Ruhl. On the other hand, the *Bastos*, *Ubiratan*, *Bouças*, & *Carvalho* 102, distributed as *S. tenuis*, is *S. umbellatus* (Lam.) Ruhl., while *Prance*, *Nelson*, *Monteiro*, & *Lima* 21039 is not eriocaulaceous.

Additional citations: COLOMBIA: Vaupés: *Maguire*, *Maguire*, & *Fernández* 44114 (N); *Maguire*, *Wurdack*, & *Keith* 41458 (W--2279266); *Schultes*, *Baker*, & *Cabrera* 18533 (W--2198905); *Schultes* & *Cabrera* 14231 (W--2198867), 19704 in part (N, W--2198923), 19918 (W--2198927), *Zarucchi* 2135 (W--2962715). VENEZUELA: Amazonas: *O. Huber* 2506 (Ld), 2643 (Ld); *Huber* & *Tillett* 5573 (Ld); *Maguire*, *Wurdack*, & *Bunting* 36336 (W--2168971), 36590 (W--2168978); *Thomas* & *Rogers* 2608 (N). BRAZIL: Amazonas: *Rosa* & *Lira* 2350 (N). Goiás: *Murça Pires* & *Santos* 16209 (N). Mato Grosso: *Rosa* & *Santos* 1962 (W--2901729). Pará: *Bastos*, *Ubiratan*, *Bouças*, & *Carvalho* 103 (N); *Daly*, *Campbell*, *Silva*, *Silva*, *Bahia*, & *Santos* D.930 (Ld, N); *Davidse*, *Rosa*, *Rosario*, & *Silva* 17595 (Ld, N, W--2967828), 17683 (N), 17870 (Ld, N); *Martinelli* 6855 [RB Herb. 203477] (Ld); *Prance*, *Pennington*, & *Murça Pires* 1296 in part (W--2514742); *Rosa* 3186 (N). Roraima: *Steward*, *Araujo*, *Buck*, *Ramos*, & *Ribamar* 74 (N). MOUNTED CLIPPINGS: *Kunth*, Enum. Pl. 3: 534. 1841 (N, W).

SYNGONANTHUS TENUIS var. *MINOR* Mold.

Additional bibliography: Mold., *Phytologia* 38: 48 & 49. 1977; *Hocking*, Excerpt. Bot. A.30: 421. 1978; Mold., *Phytologia* 50: 246. 1982.

Recent collectors report this plant abundant on white-sand campina, the inflorescence heads white, and have found it both in flower and fruit in June.

Additional citations: VENEZUELA: Amazonas: *Huber* & *Tillett* 2816 (Ld). BRAZIL: Amazonas: *Calderon*, *Monteiro*, & *Guedes* 2552 (Ld, W--2931215), 2553 (Ld, W--2931216).

SYNGONANTHUS TIRICENSIS Mold.

Additional bibliography: Mold., *Phytologia* 38: 49. 1977; Mold., *Phytol. Mem.* 2: 120 & 626. 1980.

Huber and *Steyermark* refer to this plant as very frequent on sandy wet savannas near rivers and in rocky areas among vegetation associated with *Chimantaea mirabilis*, and in low scrub of *Mallophyton chimantensis*, at 2000--2500 m. altitude, describing the inflorescence heads dry and white or grayish-white, "with a hairy bud between the leaves" or with the "center of leafy clumps gray-white lanulose", the leaves themselves short, dull-green, and rosulate. They found it both in flower and fruit in January and February.

Additional citations: VENEZUELA: Bolívar: *Huber* & *Steyermark* 6889 (Ld), 7004 (Ld), 7129 (Ld); *Steyermark*, *Espinosa*, *McDiarmid*, & *Brewer-Carías* 115882 (Ld), 115927 (Ld); *Steyermark*, *Huber*, & *Carreño* E. 128939 (Ld); *Steyermark* & *Wurdack* 739 (W--2168531--isotype, W--2407794--isotype).

SYNGONANTHUS TRICHOPHYLLUS Mold.

Additional bibliography: Mold., *Phytologia* 38: 49--50. 1977; Mold., *Phytol. Mem.* 2: 112 & 626. 1980.

SYNGONANTHUS ULEI Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 50 & 118. 1977; Mold., *Biol. Abstr.* 65: 3719 & 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

SYNGONANTHUS ULEI var. *GOYAZENSIS* Mold.

Additional bibliography: Mold., *Phytologia* 38: 118. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

Additional citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32664 in part (W--2752351--isotype).

SYNGONANTHUS UMBELLATUS (Lam.) Ruhl.

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 181. 1927; Anon., *Biol. Abstr.* 68: 4592. 1979; Hocking, *Excerpt. Bot. A.* 33: 87. 1979; Mold., *Phytologia* 42: 31 & 205--206. 1979; Mold., *Phytol. Mem.* 2: 96, 112, 120, 123, 125, 126, 168, 172, 404, 428, 444, & 626. 1980; Mold., *Phytologia* 54: 145. 1983.

Recent collectors describe this plant as a "branched herb", 10--20 cm. tall, with white inflorescence heads and flowers, and have found it growing on wet and on white-sand savannas with areas of open bare ground, "frequent to abundant" on open campo sujo, on inundated campo, and in "open treeless areas on white-sand savannas dominated by *Lagenocarpus* and *Axonopus* species interspersed with tree and shrub islands", as well as "infrequent in full sun along small rivulets on savannas", at 90--460 m. altitude, in both flower and fruit in June, September, October, and December.

Knuth (1927) cites Connell & Quelch 129 from Roraima, Venezuela.

Material of *S. umbellatus* has been misidentified and distributed in some herbaria as *S. tenuis* (Lam.) Ruhl. and as *Paepalanthus* sp. Cowan & Soderstrom 1713 and Maguire, Murça Pires, & Maguire 47130 are mixtures with *f. proliferens* Mold.

Additional citations: COLOMBIA: Vaupés: Humbert & Schultes 27367 (N); Schultes & Cabrera 19646 (W--2198919), 19918a (W--2198928). VENEZUELA: Amazonas: O. Huber 4645 (Ld); J. A. Steyermark 57846 (W--1901745); Thomas & Rogers 2592 (N). GUYANA: Cowan & Soderstrom 1713 in part (W--2678027); Goodland 912 (W--2548125); Maas, Westra, & al. 4405 (Ld, N); Maguire & Fanshawe 23252 (W--1907827); Maguire, Tillett, & Tillett 43844 (N); Mori, Persaud, & Boyan 8024 (W--2832715); A. C. Smith 2166 (W--1777551). SURINAM: Irwin, Prance, Soderstrom, & Holmgren 57536 (W--2514870); B. Maguire 24380 (W--1907838); Maguire & Stahel 23662 (W--1907849); W. W. Thomas 2381 (Ld). FRENCH GUIANA: Black & Klein 54-17351 (Cy); Halle 455 (Cy, Cy); Hooek s.n. [22

Mai 1957] (Cy, Cy); Raynal-Roques AR.19728 (Cy). BRAZIL: Amapá: Maguire, Murça Pires, & Maguire 47130 in part (W--2435292); Murça Pires & Cavalcante 52408 (W--2514665); Ribeiro 1516 (N). Pará: Bastos, Ubiranat, Bouças, & Carvalho 102 (N); Black & Ledoux 50-10380 (W--2252969); Davidse, Rosa, Rosário, & Silva 17589 (Ld, N, W--2967829); Martinelli 6848 [RB Herb. 202992] (Ld). MOUNTED CLIPPINGS: Kunth, Enum. Pl. 3: 577. 1841 (N, W).

SYNGONANTHUS UMBELLATUS f. *BRACHYPHYLLUS* (Huber) Mold.

Additional bibliography: Mold., *Phytologia* 38: 123. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168, 428, 444, & 626. 1980.

SYNGONANTHUS UMBELLATUS f. *LATIFOLIUS* Herzog

Additional bibliography: Mold., *Phytologia* 38: 121 & 123. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 123, 168, & 626. 1980.

SYNGONANTHUS UMBELLATUS var. *LIEBMANNIANUS* (Körn.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 123--124. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

SYNGONANTHUS UMBELLATUS f. *MINOR* (Miq.) Mold.

Additional bibliography: Mold., *Phytologia* 38: 124--125. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 125, 428, & 626. 1980.

SYNGONANTHUS UMBELLATUS var. *PRANCEI* Mold.

Additional bibliography: Mold., *Phytologia* 38: 121 & 125. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

SYNGONANTHUS UMBELLATUS f. *PROLIFERENS* Mold.

Synonymy: *Syngonanthus umbellatus* f. *proliferus* Mold. ex Hocking, *Excerpt. Bot. A.33*: 87. 1979. *Syngonanthus umbellatus* f. *proliferans* Mold., *Phytologia* 42: 205 sphalm. 1979.

Additional bibliography: Anon., *Biol. Abstr.* 68: 4592. 1979; Hocking, *Excerpt. Bot. A.33*: 87. 1979; Mold., *Phytologia* 42: 205. 1979; Mold., *Phytol. Mem.* 2: 120, 123, 168, 444, & 626. 1980.

The Cowan & Soderstrom 1713, cited below, and Maguire, Murça Pires, & Maguire 47130 are mixtures with typical *S. umbellatus* (Lam.) Ruhl.

Additional citations: GUYANA: Cowan & Soderstrom 1713 in part (W--2678027).

SYNGONANTHUS UMBELLATUS f. *STELLARIS* Mold.

Additional bibliography: Anon., *Biol. Abstr.* 68: 4592. 1979; Hocking, *Excerpt. Bot. A.33*: 87. 1979; Mold., *Phytologia* 42: 205. 1979; Mold., *Phytol. Mem.* 2: 112 & 626. 1980.

SYNGONANTHUS VARESCHII Mold.

Additional bibliography: Mold., *Phytologia* 38: 125. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 120 & 626. 1980.

Additional citations: MOUNTED CLIPPINGS: Mold., *Act. Biol. Venez.* 2 (7): 50. 1957 (W).

SYNGONANTHUS VENEZUELENSIS Mold.

Additional bibliography: Mold., *Phytologia* 38: 125--126. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 120 & 626. 1980.

Additional citations: VENEZUELA: Bolívar: J. A. Steyermark 59347 (W--1901814--isotype).

SYNGONANTHUS VENUSTUS Alv. Silv.

Additional bibliography: Mold., *Phytologia* 38: 126. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

Additional citations: MOUNTED ILLUSTRATIONS & CLIPPINGS: Alv. Silv., *Fl. Mont.* 1: 366--368, pl. 232. 1928 (Ld, N, W).

SYNGONANTHUS VERTICILLATUS (Bong.) Ruhl.

Additional bibliography: Mold., *Phytologia* 42: 206. 1979; Monteiro, Giuliatti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 46, 47, 53, & 58, fig. 75--78. 1979; Mold., *Phytol. Mem.* 2: 120, 168, 428, & 626. 1980.

Additional illustrations: Monteiro, Giuliatti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 58, fig. 75--78. 1979.

Hatschbach found this plant growing in wet sandy soil of campo rupestre, at 1050 m. altitude, both in flower and fruit in March.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35459 (W--2709606); Hatschbach 41321 (N, W--2840065), 42863 (Ld, W--2937363); Irwin, Maxwell, & Wasshausen 20797 (W--2598435); Irwin, Santos, Souza, & Fonsêca 22664 (W--2582556A). MOUNTED CLIPPINGS: Kunth, *Enum. Pl.* 3: 577. 1841 (N, W).

SYNGONANTHUS WAHLBERGII (Wikstr.) Ruhl.

Additional bibliography: Mold., *Phytologia* 38: 129--133. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 205, 213, 217, 221, 223, 228, 234, 236, 238, 246, 428, 444, & 626. 1980.

SYNGONANTHUS WEDDELLII Mold.

Additional bibliography: Mold., *Phytologia* 38: 133. 1977; Anon., *Biol. Abstr.* 65 (8): C.22. 1978; Mold., *Biol. Abstr.* 65: 4341. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77. 1980.

SYNGONANTHUS WEDDELLII var. *GRACILIS* Mold.

Additional bibliography: Mold., *Phytologia* 38: 133. 1977; Anon.,

Biol. Abstr. 65 (8): C.22. 1978; Mold., Biol. Abstr. 65: 4341. 1978; Mold., Phytol. Mem. 2: 168 & 626. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980.

Recent collectors describe this plant as having gray-green leaves and pale-brown involucre bractlets. They have encountered in a region of "sandstone, metamorphic and quartzite rock outcrops with associated marsh, damp flushes and grassland and some cutover mixed deciduous woodland by streams and cerrado", at 1500--1600 m. altitude.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19623 (N).

SYNGONANTHUS WELWITSCHII (Rendle) Ruhl.

Additional bibliography: Mold., Phytologia 38: 133--134. 1977; Anon., Biol. Abstr. 65 (8): C.22. 1978; Mold., Biol. Abstr. 65: 4341. 1978; Mold., Phytol. Mem. 2: 209 234, & 626. 1980.

SYNGONANTHUS WIDGRENIANUS (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 38: 178--180. 1978; Anon., Biol. Abstr. 65 (8): C.22. 1978; Mold., Biol. Abstr. 65: 4341. 1978; Mold., Phytol. Mem. 2: 168, 444, & 626. 1980.

Additional citations: BRAZIL: Minas Gerais: Widgren 822 (W--936263--cotype).

SYNGONANTHUS WIDGRENIANUS var. *PUBERULIFOLIUS* Ruhl.

Additional bibliography: Mold., Phytologia 38: 179--180. 1978; Mold., Phytol. Mem. 2: 168, 444, & 626. 1980.

SYNGONANTHUS WILSONII Mold.

Additional bibliography: Mold., Phytologia 38: 180. 1978; Mold., Phytol. Mem. 2: 91, 92, & 626. 1980.

SYNGONANTHUS XANTHOLEPIS Alv. Silv.

Additional bibliography: Mold., Phytologia 38: 180. 1978; Mold., Phytol. Mem. 2: 168 & 626. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 395. 1928 (N, W).

SYNGONANTHUS XERANTHEMOIDES (Bong.) Ruhl.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 182. 1927; Mold., Phytologia 42: 206--207. 1979; Mold., Phytol. Mem. 2: 110, 120, 123, 168, 404, 425, 428, 443, 444, 626, & 628. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980; Mold., Phytologia 50: 246 & 264 (1982), 51: 302 (1982), 53: 311 (1983), 54: 145, 234, 235, & 237 (1983), and 55: 89 & 158. 1984.

Recent collectors have encountered this plant "in wet areas in savanna leading to cano", on "wet marshy savannas leading to morichal", "in open morichal with scattered *Mauritia* palms but otherwise marshy grassland, locally with standing shallow pools of water dominated by *Eleocharis elegans*", "along marshy edges of

lower parts of quebradas among rocks, with a narrow gallery forest with *Mauritia*", and in "catinga úmida cortada por diversos igarapés", at 60--80 m. altitude, the flowering heads described as white. They have found it both in flower and fruit in February.

Knuth (1927) cites *Passarge & Selwyn* 220 from Bolívar and *Pittier* 5841 from Miranda, Venezuela.

Material of *S. xeranthemoides* has been misidentified and distributed in some herbaria as *S. caulescens* (Poir.) Ruhl. and as *Paepalanthus* sp. On the other hand, the *Aristeguieta & Tamayo* 4490, distributed as typical *S. xeranthemoides*, actually represents f. *brevifolius* Mold., while *Steyermark, Berry, Dunsterville, & Dunsterville* 117344 is var. *tricostatus* (Gleason) Mold. and *Murça Fires & Santos* 16612 is *Eriocaulon humboldtii* Kunth.

Additional citations: COLOMBIA: Meta: *Haught* 2740 (W--1707280). Vaupés: *Schultes & Cabrera* 20056 (W--2198935). VENEZUELA: Amazonas: *H. L. Clark* 6566 (N); *O. Huber* 4240 (Ld). Apure: *Davidse & Gonzalez* 13910 (Ld), 14156 (Ld), 15528 (Ld), 15734 (Ld). Táchira: *Steyermark & Liesner* 119298 (Ld). BRAZIL: Amazonas: *Calderón, Monteiro, & Guedes* 2699 (Ld, W--2931230); *A. Janssen* 460 (Ld). Goiás: *Hatschbach* 34244 (W--2839299); *Irwin, Souza, & Reis dos Santos* 10510 (N, W--2934275). Mato Grosso: *Prance, Lleras, & Coêlho* 18991 (N). Minas Gerais: *Irwin, Maxwell, & Wasshausen* 21004 (W--2598446). Pará: *Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Santos* P.25314 (W--2868546); *Rosa & Santos* 1882 (N, N). Rio de Janeiro: *Segadas Vianna, Lau, Ormond, Machline, & Lorêdo* I.380 in part (Sm). Rondônia: *Maguire, Murça Pires, Maguire, & Silva* 56445 in part (N), 56460 (W--2514897). São Paulo: *Black* 51-11027 (W--2252975).

SYNGONANTHUS XERANTHEMOIDES var. *ALPINUS* Mold., *Phytologia* 54: 235 non. nud. 1983; var. nov.

Bibliography: Mold., *Phytologia* 54: 235. 1983.

Haec varietas a forma typica speciei statura humiliore foliis 2.5--4 cm. longis pedunculis 6--10 cm. longis recedit.

This variety differs from the typical form of the species in its much smaller stature, the leaves only 2.5--4 cm. long during anthesis and the peduncles only 6--10 cm. long.

The variety is based on *Steyermark, Huber, & Carreño* E.128588 from "Pequeñas altiplanicies en la base septentrional de los farallones superiores del Amuri-tepui (Sector W del Acopán-tepui) Macizo del Chimantá, Estado Bolívar, Pos. geográfica aprox.: 5° 10' N, 62° 07' W.", Venezuela, at an altitude of about 1850 m., collected between February 2 and 5, 1983, and deposited in the Lundell Herbarium at the University of Texas. The collectors note that the plant forms dense tufts at the base of canyons. On other collections they describe the plant as a low herb common in wet sandy or swampy savannas, rather frequently forming small clumps among the grass and also forming dull-green clumps by sandstone rock outcrops at 2170--2200 m. altitude, resembling *Chimantaea huberi* in habit of growth, often growing in *C. mirabilis* vegeta-

tion, the leaves erect, stiff, olive-green, the involucral bracts "marrón claro doradas", and the inflorescence heads dry, whitish or gray.

Citations: VENEZUELA: Bolívar: Huber & Steyermark 6911 (Ld), 6973 (Ld); Steyermark, Huber, & Carreño E. 128236 (Ld), 128438 (Ld), 128588 (Ld--type), 128790 (Ld).

SYNGONANTHUS XERANTHEMOIDES var. *ANGUSTIFOLIUS* Mold., *Phytologia* 51: 302. 1982.

Bibliography: Mold., *Phytologia* 51: 302. 1982.

Huber and Medina describe this plant as an "hierba frecuente en el borde y sobre los montículos en el arbustal, cabezuelas blancas", at 120 m. altitude, and found it in both flower and fruit in February.

Citations: VENEZUELA: Amazonas: O. Huber 5112 (Ld--type); Huber & Medina 5974 (Ld).

SYNGONANTHUS XERANTHEMOIDES f. *BREVIFOLIUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 206--207. 1979; Mold., *Phytol. Mem.* 2: 120, 168, & 626. 1980; Mold., *Phytologia* 50: 246 (1982) and 54: 237. 1983.

Recent collectors have encountered this plant on "treeless wet savannas dominated by *Axonopus*, *Paspalum*, *Panicum* and in spots *Rapateaceae*", on savannas with morichales, "locally frequent in boggy areas in scrub and adjacent *Stegolepis* bogs", at the edges of waterholes on wet open sedge savannas, and on white-sand campinas, at 910--2140 m. altitude, describing the plants as to 30 cm. tall, the coarse, grass-like leaves light-green, the inflorescence heads ["spikelets"] and flowers white. They have found it in flower in June and in both flower and fruit in March, October, and December. Huber & Alarcon found it in "arbustales abiertos sobre roca arenisca".

The Calderón & al. 2699 and Segadas Vianna & al. I.380 collections, cited below, are mixtures with typical *S. xeranthemoides* (Bong.) Ruhl., while the Irwin & al. 21358, distributed and previously cited as f. *brevifolius*, actually represents var. *confusus* (Körn.) Mold.

Additional & corrected citations: VENEZUELA: Amazonas: O. Huber 4274 (Ld), 5202 (Ld). Bolívar: Davidse, Ramia, & Montes 4830 (E--2773081); Huber & Alarcon 7392 (Vo); Steyermark, Carreño Espinosa, McDuarmaid, & Brewer-Carías 116117 (E--2881851); Steyermark & Liesner 127526 (Ld); Steyermark & Nilsson 677 (W--2400110). Guárico: Aris-teguieta & Tamayo 4490 (N). GUYANA: Maas, Mennega, Welle, & Groen 5700 (Ld); Tillett & Tillett 45671 (N). BRAZIL: Amazonas: Calder-on, Monteiro, & Guedes 2555 (Ld, W--2931218), 2699 in part (W--2970399). Mato Grosso: Maguire, Murça Pires, Maguire, & Silva 56446 in part (W--2614893). Minas Gerais: Irwin, Maxwell, & Wass-hausen 20078 (W--2569051A). Rio de Janeiro: Segadas Vianna, Lau, Ormond, Machline, & Larêdo I.380 in part (W--2370793). São Paulo: Eiten & Eiten 2349 (W--2745130); Mattos & Mattos 8563 (W--2523012).

SYNGONANTHUS XERANTHEMOIDES var. *CONFUSUS* (Körn.) Mold.

Additional bibliography: Mold., *Phytologia* 38: 185--186 & 192. 1978; Mold., *Phytol. Mem.* 2: 168, 425, 428, 444, & 626. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77. 1980; Mold., *Phytologia* 54: 237. 1983.

Recent collectors describe this plant as forming hard tussocks, the leaves erect and rigid, the peduncles 30--40 cm. long, the "heads light brown", the "floral bractlets" stramineous, and the florets white. They have found the plant growing in campo rupestre, in "cerrado" seep in an area of gallery forest and adjacent cerrado, and in marshes in a region of open scrub on white sand with damp areas and extensive sedge meadows (brejo) partly burned over, at 550--1000 m. altitude, in both flower and fruit in February, March, and July.

Material of this variety has previously mistakenly been regarded as typical *S. xeranthemoides* (Bong.) Ruhl. or its f. *brevifolius* Mold.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18832 (W--2936298), 18838 (Ac, Ld, N); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15933 (W--2791601); Mori, King, Santos, & Hage 12643 (Ld, W--2854283). Goiás: Irwin, Maxwell, & Wasshausen 21358 (Ld, N, W--2598443).

SYNGONANTHUS XERANTHEMOIDES var. *GRAHAMAE* Mold.

Additional bibliography: Mold., *Phytologia* 42: 207. 1979; Mold., *Phytol. Mem.* 2: 120, 123, & 626. 1980; Mold., *Phytologia* 55: 158. 1984.

Recent collectors describe this plant as having the leaves and peduncles ("scapes") medium-green, the involucre bractlets brown or grayish-brown, and the flowers white. They report it often locally common on savannas and have also encountered it at the base of shaded canyons, in sandstone talus, on sand bars, in gravel on banks and near streams, along rocky streamsides in the mist of waterfalls, and often so abundant as to form a dense turf on wet sand. They have found it at altitudes of 100--1850 m. altitude, in flower in March and in both flower and fruit in February and from September to November.

Additional citations: VENEZUELA: Amazonas: O. Huber 1677 (Ld), 3364 (Lc); W. W. Thomas 2646 (Ld). Bolívar: Huber & Entralgo 7399 (Ld); Steyermark, Huber, & Carreño E. 128586 (Ld). GUYANA: Tillett & Tillett 45486 (N), 45844 (N).

SYNGONANTHUS XERANTHEMOIDES var. *HIRSUTUS* Mold.

Additional bibliography: Mold., *Phytologia* 42: 207. 1979; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

Additional citations: BRAZIL: Mato Grosso: Prance, Lleras, & Coelho 18981 (W--2772580).

SYNGONANTHUS XERANTHEMOIDES var. *MELANOLEPIS* (Alv. Silv.) Mold.

Additional bibliography: Mold., *Phytologia* 38: 187. 1978; Mold., *Phytol. Mem.* 2: 168, 444, & 626. 1980.

Citations: MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 396. 1928 (N, W).

SYNGONANTHUS XERANTHEMOIDES var. *MINOR* (Kunth) Mold.

Additional bibliography: Mold., Phytologia 38: 188. 1978; Mold., Phytol. Mem. 2: 168, 428, 444, & 626. 1980.

SYNGONANTHUS XERANTHEMOIDES var. *STRIGILLOSUS* Mold.

Additional bibliography: Mold., Phytologia 38: 188. 1978; Mold., Phytol. Mem. 2: 168 & 626. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 77. 1980.

Recent collectors describe this plant as a rosette herb with rigid olive-green leaves to about 6 cm. long, glossy above with white margins, pale-green beneath, the peduncles ["scapes"] to 30 cm. tall, grayish, and the involucre bractlets stramineous. They have found it growing in open scrub on white sand with damp areas and extensive sedge meadows (brejo) partly burned over, at 950 m. altitude, in both flower and fruit in February.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18831 (K).

SYNGONANTHUS XERANTHEMOIDES var. *TRICOSTATUS* (Gleason) Mold.

Additional bibliography: Mold., Phytologia 42: 206 & 207. 1979; Mold., Phytol. Mem. 2: 120, 123, 168, 444, & 626. 1980.

Recent collectors refer to this plant as a common herb, 30--50 cm. tall, the leaves erect, borne in several planes, coriaceous, dull- or rich-green, the inflorescence heads dry, grayish-white or white, the involucre bractlets buff-brown, and the flowers dull-white. They describe it as growing in dense clumps or tufts and have encountered it around swamps, frequent on open or white-sand savannas, among rocks in sandy areas near rapids, locally common under taller plants in moist areas of savannas, on wet savannas with a thin soil layer over white sand, and on rocky wet savannas dominated by *Stegolepis* and *Cottendorfia*, with *Nietneria*, *Tofieldia*, *Xyris*, *Abolboda*, and *Lagenocarpus* also present, at 100--2140 m. altitude, in flower in March, in fruit in February, May, and August, and in both flower and fruit in June, October, and November. Huber & Tillett describe it as an "hierba arrosetada muy frecuente en todas la sabana anegadiza".

The Steyermark 75854 collection, cited below, was distributed as and previously mistakenly cited as *S. reflexus* Gleason.

Additional citations: VENEZUELA: Amazonas: O. Huber 1076 (Ld), 3102 (Ld); Huber & Tillett 2859 (Ld), 5286 (Ve); Wurdack & Adderley 43691 (W--2320947). Bolívar: Huber, Alarcon, & Barreat 6729 (Ld); Huber, Rodriguez, & Alarcon 7254 (Vo), 7329 (Ld); Moore, Ambrose, Dietz, & Pfister 9647 (Ba); J. A. Steyermark 75854 (Ld, W--2407773), 93485 (W--2584113); Steyermark, Berry, Dunsterville, & Dunsterville 117344 (Ld); Steyermark, Espinosa, McDiarmid, & Brewer-Carías 116117 (Ld); Steyermark & Nilsson 573 (W--2400109), 668 (W--2400112); W. W. Thomas 2508 (N), 2707 (N). GUYANA: Maas & Westra 4412 (Ld, N); Maguire, Tillett, & Tillett 43833

(Ld, N). BRAZIL: Minas Gerais: *Maguire, Mendes Magalhães, & Maguire 49090* (W--2435308).

SYNGONANTHUS XERANTHEMOIDES var. *VERNONIOIDES* (Kunth) Mold.

Additional bibliography: Mold., *Phytologia* 38: 183, 185--188, & 190--192. 1978; Monteiro, Giulietti, Mazzoni, & Castro, *Bot. Univ. S. Paulo* 7: [43], 46--48, 53, & 58, fig. 70. 1979; Mold., *Phytol. Mem.* 2: 168, 404, 428, 444, 626, & 628. 1980; Mold., *Phytologia* 50: 264. 1982.

Illustrations: Monteiro, Giulietti, Mazzoni, & Castro, *Bot. Univ. S. Paulo* 7: 58, fig. 70. 1979.

SYNGONANTHUS XINGUENSIS Mold.

Additional bibliography: Mold., *Phytologia* 38: 192. 1978; Mold., *Phytol. Mem.* 2: 168 & 626. 1980.

SYNGONANTHUS YACUAMBENSIS Mold.

Additional bibliography: Mold., *Phytologia* 42: 208. 1979; Mold., *Phytol. Mem.* 2: 129 & 626. 1980; Hocking, *Excerpt. Bot. A.* 36: 23. 1981; Mold., *Phytologia* 53: 264. 1983.

Material of this species has been mistakenly distributed in some herbaria as *Eriocaulon* sp.

Additional citations: ECUADOR: Azuay: *Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 4814* (Ac, E--2773087, Eu--55331, Ut--352572B), 5080 (Ac, E--2773091); *Prieto P.197* (W--2056919--isotype). Loja: *Balslev 1409* (Ld, N).

SYNGONANTHUS YAPACANENSIS Mold.

Additional bibliography: Mold., *Phytologia* 38: 193. 1978; Mold., *Phytol. Mem.* 2: 120 & 626. 1980.

Recent collectors describe this plant as growing 15--20 cm. tall, the inflorescence heads dry and gray, grayish-white, or white. They have found it growing on white-sand savannas and in open grassland, "formando pequeños cojines en la sabana", at 95--125 m. altitude, referring to it as "frequent", "rather frequent", or "dominant on open savannas", in flower in April and both in flower and fruit in February, March, May, and August.

Additional citations: VENEZUELA: Amazonas: *Davidse, Huber, & Tillett 16948* (Ld), 17037 (Ld); O. Huber 2464 (Ld), 3227 (Lc), 3407 (Lc), 3852 (Lc), 5088 (Ld), 6078 (Ld); *Huber & Medina 5760* (Ld), 5806 (Ld); *Huber & Tillett 3061* (Ld); *Huber, Tillett, & Davidse 3713* (Ld); *Maguire, Cowan, & Wurdack 30782* (W--2046514--isotype); *Maguire, Wurdack, & Bunting 37615* (W--2169000), 37672 (W--2169003).

SYNGONANTHUS YAPACANENSIS var. *HIRSUTUS* Mold.

Additional bibliography: Mold., *Phytologia* 38: 193. 1978; Mold., *Phytol. Mem.* 2: 120 & 626. 1980.

Huber refers to this plant as an herb forming "pequeños cojines", rather frequent on open savannas, at 100--120 m. altitude, the peduncles ("scapes") bluish-green and the inflorescence heads gray or white, and found it both in flower and fruit

in March and August.

Additional citations: VENEZUELA: Amazonas: *O. Huber* 2411 (Ld), 5145 (Ld); *Huber & Tillett* 2914 (Ld), 3071 (Ld).

TONINA Aubl.

Additional & emended bibliography: J. F. Gmel. in L., *Syst. Nat.*, ed. 13, imp. 1, 2: 206. 1791; Reichenb., *Conspect. Reg. Veg.* 1: 58. 1828; Durand, *Ind. Gen. Phan.* 454. 1888; Post & Kuntze, *Lexicon* 293, 563, & 623. 1904; Domin, *Ann. Jard. Bot.* 24 [ser. 2, 9]: 248. 1911; Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 705--707, fig. 479. 1911; J. C. Willis, *Dict. Flow. Pl.*, ed. 5, 654. 1925; Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 183. 1927; Stapf, *Ind. Lond.* 3: 90 (1930) and 6: 316. 1931; J. C. Willis, *Dict. Flow. Pl.*, ed. 6, 654. 1951; Rouleau, *Guide Ind. Kew.* 96, 189, & 270. 1970; Hocking, *Excerpt. Bot. A.* 23: 389. 1974; Thanikaimoni, *Inst. Franç. Pond. Trav. Sect. Scient. Tech.* 13: 236 & 285. 1976; Latorre, Ortega, & Inca, *Cienc. Naturaleza* 18: 62. 1977; Bodley, *Lab. Anthropol. Wash. St. Univ. Rep. Invest.* 55: 23. 1978; Giuliatti, *Bol. Bot. Univ. S. Paulo* 6: 63. 1978; Mold., *Phytologia* 42: 208. 1979; Monteiro, Giuliatti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 46, 47, 54, & 59, fig. 102 & 103. 1979; Mold., *Phytol. Mem.* 2: 67, 75, 76, 79, 82, 84, 91, 104, 112, 120, 123, 125, 126, 129, 135, 169, 445, & 626. 1980; Mold., *Phytologia* 45: 40 & 511. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77. 1980; F. C. Seymour, *Phytol. Mem.* 1: 85 & 313. 1980; Hocking, *Excerpt. Bot. A.* 36: 23. 1981; Mold., *Phytologia* 50: 242 & 511 (1982) and 54: 234 & 237. 1983; Badillo, Schnee, & Rojas, *Ernstia* 14: [Clave Fam. Pl. Sup. Venez., ed. 6] 213. 1983; Mold., *Phytologia* 52: 511 (1983), 54: 511 (1984), and 55: 88 & 166. 1984.

The *Oldeman* B.2674, distributed as *Tonina* sp., seems to be a sterile specimen of *Syngonanthus macrocaulon* Ruhl., while *Prance & Ramos* 23562 is not *ericaulaceae*.

TONINA FLUVIATILIS Aubl.

Additional synonymy: *Tonina flaviatilis* Aubl. ex Mold., *Phytol. Mem.* 2: 445 in syn. 1980. *Tonina aquatilis* Aubl. ex Mold., *Phytologia* 52: 129 in syn. 1982.

Additional bibliography: Domin, *Ann. Jard. Bot. Buitenz.* 24 [ser. 2, 9]: 248. 1911; Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 705--707, fig. 479. 1911; Knuth, *Feddes Repert. Spec. Nov.* 43: [Init. Fl. Venez.] 183. 1927; Savage, *Cat. Linn. Herb. Lond.* 21. 1945; Latorre, Ortega, & Inca, *Cienc. Naturaleza* 18: 62. 1977; Mold., *Phytologia* 42: 208. 1979; Monteiro, Giuliatti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: [43], 46, 54, & 59, fig. 102 & 103. 1979; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 77. 1980; F. C. Seymour, *Phytol. Mem.* 1: 85. 1980; Hocking, *Excerpt. Bot. A.* 36: 23. 1981; Mold., *Phytologia* 50: 242 (1982), 54: 234 & 237 (1983), and 55: 88 & 166. 1984.

Additional illustrations: Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 705, fig. 479. 1911; Monteiro, Giuliatti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 59, fig. 102 & 103. 1979.

Recent collectors describe this plant as an herb with a dense fibrous mat of roots, 30--40 cm. tall, the stems hairy, reclining at the base when submerged, erect above water, the young inflorescences green or whitish, the older ones brown or "marrom", brown when in fruit. They describe it as forming dense swards or dense mats in shallow water, the stems branched at the base, the leaves grass-green, the inflorescence heads with pale-brown bractlets, and the fruit greenish-brown. They have found it growing in pastures and wet swales, in wet cultivated soil, in open areas near streams, on llanos with pines and grasses, "rooted in white sand in running tea-brown water at roadsides in primary lowland rainforest with heavy leaf litter", in "damp marshy areas in open secondary growth", in capoeira, at the margins of creeks, in wet soaked soil of waste places on riverbanks, in boggy areas along trails and in sand along rivers, in open bogs, in fields with low swampy depressions on level areas of valleys, locally common at the edges of ponds, or even completely "terrestrial".

Almeda and his associates refer to this plant as a "slender colonial herb mostly less than 1 foot tall, the perianth brown and scarious, locally abundant in secondary vegetation along fencerows and in moist depressions". Other collectors have found it in and around morichal dominated by *Mauritia flexuosa* and "common" in old pastures. Steyermark & Liesner describe it as "forming bunches of sprawling stems along dried stream margins"; Cowan reports it common in association with *Stemodia*, *Cyperus*, and *Aciotis*; Folsom refers to it as "terrestrial in ditches and clearings". It has been encountered from sealevel to 1000 m. altitude, in both flower and fruit from March to August, in flower also in November and in fruit also in January and October. A photograph was made of the habitat locality of Davidson 3644. Clark collected the species in an area of 3400--3600 mm. average annual rainfall.

Material of *T. fluviatilis* has been misidentified and distributed in some herbaria as *f. parvifolia* Mold., *Anacharis* sp. and *Mayacaceae* sp. and in at least one herbarium (perhaps through an accidental transposition of labels) as *Hyptis longifolia* Epling. On the other hand, the Lobo, Vilhena, & Ribeiro 115, distributed as *Tonina fluviatilis*, is not *eriocaulaceae*.

Additional citations: MEXICO: Tabasco: C. Cowan 3336 (N); Solano & Cowan 2518 (N). HONDURAS: Gracias a Dios: C. Nelson 824 (E--2773099); Nelson & Romero 4123 (N). COSTA RICA: Puntarenas: Almeda, Wilbur, & Daniel 3339 (N); Wilbur, Almeda, & Daniel 23621 (Mi). San José: Weston, Weston, & Weston 4297 (Lc). PANAMA: Coclé: D'Arcy 11340 (Ld); Hammel 3417 (E--2773074). Colon: Correa, Mendieta, & Mayo 2041 (E--2773098). Veraguas: Folsom 3000 (Ld); Witherspoon & Dressler 8899 (W--2846693). TRINIDAD AND TOBAGO: Trinidad: Adams & Thomas 14565 (Mi); Barnard 3 (E--2773100); Ramcharan & Khan 513 (N). COLOMBIA: Apazonas: Schultes & Cabrera 15611 (W--2144050). Amazonas/Vaupés: Schultes & Cabrera 14030 (W--2171309), 14053 (W--2171321), 14556 (W--2198873), 14604 (W--2198874), 14618 (W--

2198875). Antioquia: Alverson, White, & Shepherd 178 (N); J. Denslow 2521 (Ws); Schultes & Cabrera 18648 (W--2198907). Magdalena: Haught 2287 (W--1706951). Meta: Haught 2579 (W--1707159). Putumayo: Schultes & Cabrera 19063 (W--2198913). Valle: Bristol 665 (W--2899593). Vaupés: Schultes & Cabrera 17162 (W--2198884), 19429 (W--2198918). VENEZUELA: Amazonas: H. L. Clark 6566 (Ld, N). Bolívar: J. A. Steyermark 88759 in part (W--2435335); Steyermark & Liesner 127665 (Ld). Guárico: Davidse 3800 (Ld). Táchira: Liesner & González 10418 (Ld); Steyermark & Liesner 119298 (N). Zulia: DeBruijn 1475 (W--2837700). GUYANA: Maas, Westra, & al. 3605 (Ld), 3808 (Ld, N). SURINAM: W. W. Thomas 2364 (N). FRENCH GUIANA: Cremers 5372 (Cy, Ld); Granville 3186 (Ld); Raynal-Roques 19741 (Cy), 19824 (Cy). PERU: Loreto: Davidson 3644 (N); Gentry, Díaz, Aronson, & Jaramillo 27685 (N); McDaniel, Rimachi, & Folsom 20534 (N). BRAZIL: Amazonas: Baldwin 3555 (Mi); Calderón, Monteiro, & Guedes 2954 (Ld); Kubitzki, Calderón, & Poppendieck 79-91 (W--2917261). Bahia: Duarte 6070 [Herb. Jard. Bot. Rio Jan. 113027] (Mi, W--2928661); Harley, Mayo, Storr, Santos, & Pinheiro in Harley 17980 (Ld, N). Maranhão: Jangoux & Bahia 185 (N); Rosa & Villar 2781 (N, N). Pará: Cid, Mota, Ramos, & Rosas 2246 [Herb. Inst. Nac. Pesq. Amaz. 96487] (N, N, W--2988103); Martinelli 6818 [RB Herb. 203422] (Ld); Plowman, Davidse, Rosario, & Santos 9122 (Ld, N, W--2967844); Prance & Pennington 1746 (W--2602078). MOUNTED CLIPPINGS: K&rn. in Mart., Fl. Bras. 3 (1): 302. 1863 (W).

TONINA FLUVIATILIS f. *OBTUSIFOLIA* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 389. 1974; Mold., Phytologia 38: 202. 1978; Mold., Phytol. Mem. 2: 123 & 626. 1980.

TONINA FLUVIATILIS f. *PARVIFOLIA* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 389. 1974; Mold., Phytologia 38: 202. 1978; Mold., Phytol. Mem. 2: 120 & 626. 1980; Mold., Phytologia 54: 234 & 237. 1983.

Killip reports this plant forming mats in open marshy ground along streams at 200--275 m. altitude and found it in both flower and fruit in April. His collection was erroneously distributed and previously cited by me as typical *T. fluviatilis* Aubl. On the other hand, Cremers 5372, Granville 3186 and Raynal-Roques 19741, distributed as f. *parvifolia*, are better regarded as merely slightly smaller-leaved forms of typical *T. fluviatilis* Aubl., not nearly small enough to qualify as representative of the present form.

Additional emended citations: COLOMBIA: Chocó: Killip 35273 (N, S, W--1772008).

WURDACKIA Mold.

Additional bibliography: Rouleau, Guide Ind. Kew. 200 & 270. 1970; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Mold., Phytologia 42: 208 (1979) and 45: 40 & 512. 1980; Mold., Phytol.

Mem. 2: 121 & 626. 1980; Hocking, Excerpt. Bot. A.36: 23. 1981; Badillo, Schnee, & Rojas, Ernstia 14: [Clave Fam. Pl. Sup. Venez., ed. 6] 213. 1983.

WURDACKIA FLABELLIFORMIS Mold.

Additional citations: VENEZUELA: Bolívar: Steyermark & Wurdack 671 (Ld--photo of isotype, W--2168519--isotype, W--2407793--isotype).

- - - - -

ADDITIONAL NOTES ON THE GENUS *CORNUTIA*. VII

Harold N. Moldenke

The last previous in this series of notes on this genus was published in Phytologia 41: 123--130 (1978). For a detailed explanation of the herbarium acronyms used in this and all others in my continuing series of papers, see Phytologia Memoirs 2:463--469 (1980) and Phytologia 50: 268 (1982).

CORNUTIA Plum.

Additional synonymy: *Cornutia* Gaertn. f. ex Meisn., Pl. Vasc. Gen. 2: 199 in syn. 1840.

Additional & emended bibliography: Neck., Elem. Bot. 1: 352--353. 1790; Willd. in L., Sp. Pl., ed. 4, 3 (2): 6. 1802; Gaertn. f. in Gaertn., Fruct. Sem. Pl. 3: 172--173, pl. 213. 1805; Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 641 (1819) and 3: 56. 1823; Spreng. in L., Syst. Beg., ed. 16, 1: 39. 1825; Loud., Hort. Brit., ed. 1, 529 (1830) and ed. 2, 529. 1832; G. Don in Loud., Hort. Brit., ed. 3, 529. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Reichenb., Deutsch. Bot. [Repert. Herb. Nom.] 108. 1841; Brongn., Enum. Gen. Pl., ed. 1, 65. 1843; D. Dietr., Syn. Pl. 3: 612. 1843; Voigt, Hort. Suburb. Calc. 473. 1845; Walp., Repert. Bot. Syst. 4: 80--81 & 125. 1845; Lindl., Veget. Kingd. 664. 1846; A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 13: 184 & 185. 1849; Brongn., Enum. Gen. Pl., ed. 2, 120. 1850; Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 220 & 222--223. 1863; Seem., Fl. Vit. 186. 1866; Pfeiffer, Nom. Bot. 1 (1): 64 (1873), 1 (2): 876--877 & 1671 (1874), 2 (1): 24 (1874), and 2 (2): 1569, 1570, & 1593. 1874; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 31: 81. 1886; Durand, Ind. Gen. Phan. 321. 1888; Baill., Hist. Pl. 11: 86 & 111. 1891; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 135--138, 142, & 169 (1895) and 4 (3a): [381]. 1897; Post & Kuntze, Lexicon 143 & 688. 1904; D. H. Scott in Soler., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 2: 1021. 1908; Urb., Symb. Antil. 4: 537. 1911; E. D. Merr., Interpret. Rumph. Herb. Amboin. 450. 1917; J. C. Willis, Dict. Flow. Pl., ed. 5, 179. 1925; Dop, Bull. Soc. Hist. Nat. Toulouse 57: 203. 1928; E. D.

Merr., Trans. Am. Philos. Soc., ser. 2, 24 (2): 334. 1935; Lemée, Dict. Descrip. Syn. Gen. Pl. Phan. 8b: 655. 1943; Savage, Cat. Linn. Herb. Lond. 107 & 222. 1945; H. N. & A. L. Mold., Pl. Life 2: 16, 18, 20--24, 32, 54, 65, 77, & 84. 1948; Metcalfe & Chalk, Anat. Dicot. 2: 1035--1037 & 1041, fig. 248 G. 1950; Lawrence, Taxon. Vasc. Pl., imp. 1, 688 & 788. 1951; J. C. Willis, Dict. Flow. Pl., ed. 6, 179. 1951; Alain in Leon & Alain, Fl. Cuba, imp. 1, 4: 280 & 313--314, fig. 135. 1957; Dalla Torre & Harms., Gen. Siphonog., imp. 2, 432 (1958) and imp. 3, 432. 1963; Lourteig, Taxon 15: 30. 1966; Rouleau, Guide Ind. Kew. 49 & 352. 1970; Lawrence, Taxon Vasc. Pl., imp. 2, 688 & 788. 1971; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Serbanescu-Jitaru & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 110, 111, 116, & 119, pl. 2, fig. 6. 1973; Thanikaimoni, Inst. Franc. Pond. Trav. Sect. Scient. Techn. 12 (2): 36 (1973) and 13: 66 & 328. 1976; L. H. & E. Z. Bailey, Hortus Third 1149. 1976; Barclay & Perdue, Cancer Treat. Rep. 60: 1111. 1976; Bodley, Lab. Anthropol. Wash. Univ. Rep. Invest. 55: 20. 1978; Fournet, Fl. Illust. Phan. Guad. Mart. 1391 & 1412. 1978; Mold., Phytologia 41: 123--130. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41, 45, 47, & 51. 1978; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 2: 28 & 39. 1979; Hocking, Excerpt. Bot. A. 33: 5, 91, & 165. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytologia 41: 505. 1979; Rogerson, Becker, Long, & Prince, Bull. Torrey Bot. Club 106: 154. 1979; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 466. 1980; Mold., Phytologia 45: 40, 490, & 505 (1980) and 47: 143. 1980; Mold., Phytol. Mem. 2: 5, 61, 62, 71, 74, 75, 77, 78, 80--83, 85, 89, 93, 95, 97, 100, 102, 103, 107, 115, 124, 126, 128, 130, 133, 140, 352, 395, 412, & 545--546. 1980; F. C. Seymour, Phytol. Mem. 1: 243 & 306. 1980; Mold., Phytologia 47: 505 (1981) and 49: 456 & 507. 1981; Rouleau, Repert. Nom. Gen. Ind. Kew. 480. 1981; Baumgardt, How Identify Flow. Pl. Fam. 264. 1982; Liogier & Martorell, Fl. Puerto Rico 152 & 311. 1982; Mold., Phytologia 50: 240, 243, 259, & 505 (1982) and 52: 116--118, 120, & 230. 1982; Reis & Lipp, New Pl. Sources Drugs 251. 1982; Badillo, Schnee, & Rojas, Ernstia 14: [Clave Fam. Pl. Sup. Venez. ed. 6] 223. 1983; C. L. & A. A. Lundell, Wrightia 7: 119 & 159. 1983; Mold., Phytologia 52: 503 (1983) and 54: 229, 231, & 242. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 300, 308, 329, & 335. 1983; Raj, Rev. Palaeobot. Palyn. 39: 355, 360, 370--371, 377, 381, 383, 384, 389, 406, 411, & 412, pl. 11, fig. 4 & 5. 1983; Mold., Phytologia 54: 504. 1984.

It is of interest to note that Reichenbach (1828) classified this genus in the *Lamiaceae*.

Barclay & Perdue (1976) report an unidentified member of this genus as being "promising" in cancer treatment.

The *Løjtnant* & Molau 13356 & 13451, distributed as representing *Cornutia*, actually are *Aegiphila integrifolia* (Jacq.) Jacq., while Poole, Guzman, & López 1455 is *Priva lappulacea* (L.) Pers., and Chavelas P., Esparza, & Aceves ES.2492 and Pittier & Tonduz 8619 are not verbenaceous.

CORNUTIA AUSTRALIS Mold.

Additional bibliography: Mold., *Phytologia* 41: 123. 1978; Hocking, *Excerpt. Bot. A.33*: 91. 1979; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 22. 1979; Mold., *Phytol. Mem.* 2: 140 & 545. 1980.

CORNUTIA AUSTRALIS var. *OCCIDENTALIS* Mold.

Additional bibliography: Mold., *Phytologia* 41: 123. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 22. 1979; Mold., *Phytol. Mem.* 2: 128 & 545. 1980.

CORNUTIA COERULEA (Jacq.) Mold.

Additional & emended bibliography: G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Walp., *Repert. Bot. Syst.* 4: 80. 1845; Mold., *Phytologia* 41: 123. 1978; Mold., *Phytol. Mem.* 2: 93, 352, & 545. 1980.

CORNUTIA GRANDIFOLIA (Schlecht. & Cham.) Schau.

Additional synonymy: *Cornutia grandifolia* var. *grandifolia* (S. & C.) Schau. ex F. C. Seymour, *Phytol. Mem.* 1: 243. 1980.

Additional & emended bibliography: Walp., *Repert. Bot. Syst.* 4: 80. 1845; H. N. & A. L. Mold., *Pl. Life* 2: 77 & 84. 1948; Metcalfe & Chalk, *Anat. Dicot.* 2: 1036 & 1037, fig. 248 G. 1950; Mold., *Phytologia* 41: 123--127 & 130. 1978; Hocking, *Excerpt. Bot. A.33*: 5 & 165. 1979; Mold., *Phytol. Mem.* 2: 61, 62, 71, 74, 75, 77, 78, 80, 81, 83, 85, 352, 395, & 545. 1980; F. C. Seymour, *Phytol. Mem.* 1: 243. 1980; Mold., *Phytologia* 50: 240, 243, & 259 (1982) and 52: 116 & 118. 1982; Raj, *Rev. Palaeobot. Palyn.* 39: 355, 371, 383, 394, 406, 411, & 412, pl. 11, fig. 5. 1983.

Additional illustrations: Metcalfe & Chalk, *Anat. Dicot.* 2: 1036, fig. 248 G. 1950; Raj, *Rev. Palaeobot. Palyn.* 39: 411, pl. 11, fig. 5. 1983.

Recent collectors describe this plant as a shrub, 2--5 m. tall, a treelet, or even a small tree, 2--"30" m. tall, with tan pubescence, "all the inflorescence branches except the central peduncle violet", buds purple, flowers fragrant, anthers and stigmas purple, and fruit green, tinted purple, or lavender. They have found it growing along roadsides, in open fields, along small streams, in mountain rainforests, premontane and lower mountain wet forests, primary and gallery forests, disturbed forests and forest edges, in the secondgrowth of cloudforests on steep slopes, on rocky sunny hillsides and cliffs and disturbed evergreen hillsides, in grassy roadsides with *Polymnia maculata*, among the riparian vegetation of *Ficus*, *Inga*, *Lindenia*, etc. in limestone areas, frequent in acahual near rivers, "common along roadsides and on river flood-plains among metamorphic rock", and "locally common in patches of evergreen forest on slopes", at 370--2000 m. altitude, in flower in January, April, and from June to September, in fruit in July, August, and November. Tomlin notes: "berry purple", but the fruit is a drupe; Castro refers to the plant as "herbaceous"; Grijalva & Araquistain mistaken describe the inflorescence as a raceme.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"ARCHAEOLOGICAL COMMENTARY ON THE BIBLE" by Gonzalo Baez-Camargo, xxxvii & 289 pp. & 30 b/w photo. Doubleday & Company, Inc., New York, N. Y. 10167. 1984. \$17.95.

This book is a new and updated translation by the recently deceased, scholarly, Mexican author from his Spanish language edition of 1979. While it is not meant to be an exhaustive study, it is a very accessible study since it is arranged from Genesis to Revelation by chapter and verse, yielding additional factual or possible background material. The bibliography, in English, is scant but it includes those important works of greater detail and with their own fuller references. There are three groups of photographic plates interspersed in the text showing 30 excavations sites and buildings.

"AN INTRODUCTION TO THE INTERPRETATION OF QUANTAL RESPONSES IN BIOLOGY" by P. S. Hewitt & R. L. Plackett, vi & 82 pp., 26 b/w fig. & 22 tab. University Park Press, Baltimore, Maryland 21202. 1979. \$11.95 paperbound.

This "how-to" self or classroom text was first published in London in the same year. Quantal or all-or-none responses are important in many branches of biology and derived technologies for human or other mammalian (lab rats) toxicities in antibiotics, other medications, environmental pollutants, fungicides, herbicides, insecticides, nematocides, molluscicides and mixtures of drugs. The text also explains the uses and computations of probit and logit analyses. Today's greater availability of more capable computational machines certainly increases the value of this book.

"REMOTE SENSING APPLICATION IN AGRICULTURE AND HYDROLOGY" edited by Georges Frayse, ix & 502 pp., 333 b/w fig., 156 tab., 37 photos & 3 color plates. A. A. Balkema, Rotterdam, Netherlands & Salem, New Hampshire 03079. 1980. \$75.00.

These are the important proceedings of a seminar held at the joint research center of the commission of the European communities in the framework of the ISPRA (Varese) Italy. There are 21 papers under agriculture and 9 under hydrology. Among the former are papers on remote sensing in forestry, agromet models, computer-aided analysis techniques for mapping earth features, properties of vegetation, especially crops and forests. The

latter has papers on water resources and snowcover monitoring from satellite data, electromagnetic studies of ice and snow, radar and satellite use for monitoring rainfall, and use of a mathematical model predicting flood hydrographs in watershed and river channels. The illustrative material is helpful, the two color plates show impressive microwave radiometer images. The printing types vary since the papers were the individual authors' responsibility. Most are neat and accurate, but one fails to capitalize the first letter in a genus name (p. 64) and the next paper has a couple of misspellings and, as well, miserable typing for a report of this importance.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY, Volume 34, 1983" edited by Winslow R. Briggs with Russell L. Jones & Virginia Walbot, x, & 492 pp., 1 b/w photo., 34 fig. & 7 tab. Annual Reviews, Inc., Palo Alto, California 94306. 1983. \$27.00 USA & \$30.00 elsewhere.

Characteristic of all the Annual Reviews that I have seen over many years there is an abiding excellence in subject choice, treatment, literature citations and presentation. The prefatory chapter in this volume is by Pei-sung Tang whose training and career started in Old China, whose advance training involved Johns Hopkins U., Woods Hole Labs and Harvard U., and whose return to China in its war years and now the New China is where even at retirement age he still influences the university and laboratory research and teaching throughout that vast land. There are important papers on the biosynthesis of arabino-galactan-proteins, myo-inositol, cytokinins, chloroplast genes, and stomatal guard cells among others.

"Henry D. Thoreau's 'THE ILLUSTRATED A WEEK ON THE CONCORD AND MERRIMACK RIVERS' with Photographs from the Gleason Collection" edited by Carl F. Hooe, William L. Howarth & Elizabeth Hall Witherell, xxxvi & 415 pp., 48 b/w photos & 1 map. Princeton University Press, Princeton, New Jersey 08540. 1984. \$25.00

This writing of Thoreau makes excellent, often nostalgic, reading. It predates "Walden" and tells of the 1839 canoe trip with his older brother John and when published was as a memorial to him. There are the usual naturalistic descriptions of areas en route and the literary digressions invoked by something seen, heard or discussed en route. As a frontispiece the editors use Thoreau's own map of this journey. The other illustrations are the beautiful photographs taken by Herbert W. Gleason who himself made the same trip some years later (1899), etc. for this expressed purpose. Princeton University Press and staff can certainly be proud of this Thoreau edition as of the similarly illustrated "Walden". The print is clear and a good size for leisure reading.

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A NEW SPECIES OF MENTZELIA SECTION BARTONIA (LOASACEAE)

FROM WESTERN NEVADA

Henry J. Thompson and Barry A. Prigge
Department of Biology, University of California
Los Angeles, California 90024

Abstract

A new species, Mentzelia candalariae, is described from west-central Nevada. It appears to be most closely related to M. pterosperma, M. pumila, and M. albescens.

Several years ago we examined all of the specimens of Mentzelia Section Bartonia in United States herbaria at which time we set aside a few specimens that had been collected by W. H. Shockley in 1882 and 1888 near the now abandoned mining town of Candelaria, Mineral County, Nevada. These collections were thought to represent an undescribed element in Section Bartonia and were referred to in various reports and letters as the "Candelaria" population. Subsequent field studies, collections, cultivation in the experimental garden, and interspecific hybridizations of these plants convinced us of their uniqueness. Now the excellent collections by Arnold Tiehm of Reno, Nevada, have provided abundant material of the species, extending its known range and showing both its variation and distinctiveness.

Mentzelia candalariae Thompson & Prigge, sp. nov.

A M. pterosperma recedens sed petalis 5, 6-10 mm longis 2-4 mm latis acuminatis sepalis parum longioribus, staminibus petaloideis nullis, alis seminum conspicuis, 0.6 mm latis cellulis testarum parietibus radialibus rectis vel leviter undulatis.

Herbaceous perennial, stems 15-30 (-48) cm tall, erect, single or several from base, white, pubescent with glochidiate hairs and scattered pointed hairs; rosette leaves oblanceolate to obovate, irregularly and bluntly lobed or sinuate, lower cauline leaves linear-lanceolate, 2-10 cm long, 1-2 cm wide, irregularly dentate, shallowly lobed or nearly entire, upper leaves similar, lower leaf surfaces pubescent with long pointed hairs and smaller glochidiate hairs, upper surfaces less densely pubescent with scattered curved, pointed hairs, leaf margins with glochidiate hairs, bracts at base of or just below the capsules, linear and entire; flowering period May and June, flowers opening in late afternoon; calyx lobes triangular-acuminate, 5-8 mm long; petals 5, yellow, 6-10 mm long, 2-4

mm wide, narrowly lanceolate-acuminate; stamens 2-5 mm long, filaments narrow, the outer 5 dilated to about 1 mm wide, petaloid stamens absent and thus the petals distinct from the stamens; styles 5-7 mm long; capsules cup-shaped to subcylindric, 8-12 (-14) mm long; seeds lenticular, ovate, 2.5-3.5 mm long including the conspicuous wing which is 0.6 mm wide, seed surface light tan to nearly white, colliculate, the radial walls of seed coat cells straight to slightly wavy, center of outer tangential walls raised with 10-15 papillae; chromosome number $n=11$; self-compatible.

Type: USA. Nevada, Mineral County, hillsides 2 mi east of Candelaria, Lat. N $38^{\circ} 10'$; Long. $118^{\circ} 04' W$, 5500 ft elev. 5 June 1968, J. Zavortink & H. J. Thompson 3164 (HOLOTYPE: RSA. Photographs: LA, UTC, US, BRY, TEX, UC, RENO).

Paratypes: USA. Nevada. Purshing Co.: foothills of Stillwater Range, NW side of Dixie Valley just N of county line, T25N, R37E, sec. 29, with Atriplex on dark, loose volcanic gravel hillsides, 3800 ft, 24 June 1980, Tiehm 6017 (CAS, RSA). Churchill Co.: Camp Terrill, Lat. N $39^{\circ} 04'$; Long. $118^{\circ} 42' W$, Ross 31 (JEPS); NW side of Dixie Valley, W of Boyer Ranch T24N, R36E, sec. 11, only 6 plants seen, light colored steep hillside, 3800 ft, with Atriplex, 20 May 1979, Tiehm 4873 (CAS); Stillwater Range, NW side of Dixie Valley, NNE of Boyer Ranch, T25N, R37E, sec. 32, light colored clayey hillsides, 3800 ft, with Atriplex, 23 June 1980, Tiehm 6000 (CAS, RSA); Hot Springs Mts., 3.5 air mi SE of Desert Peak, T22N, R27E, sec. 25, on steep, light colored clay hills, 4500 ft, 16 June 1983, Tiehm 7916 (CAS). Mineral Co.: Candelaria, Shockley sn, August 1888 (JEPS), Shockley sn in 1882 (GH, JEPS), Shockley sn, July 1888 (DS, NY). Esmeralda Co.: 8 mi SW on Hwy 47 from Blair Junction, T1N, R39E, Neese & White 8817 (BRY); Monte Cristo Range, 2.5 air mi N of Blair Junction, T2N, R38E, sec. 6, barren clay hillsides, 5300 ft, 6 May 1981, Tiehm 6381 (CAS); Montezuma Valley, 1 road mi N of playa on valley floor, 11.5 air mi NW of Goldfield, T1S, R41E, sec. 5, in gravel wash, 4900 ft, with Atriplex and Hymenoclea, 5 May 1981, Tiehm 6353 (CAS); between Montgomery Pass and Columbus Salt Marsh, Eastwood & Howell 9524 (CAS). Nye Co.: Ralston Valley, Hunts Canyon, T8N, R45E, sec. 35, gravelly slope, 6700 ft, 31 July 1978, Goodrich 12056 (BRY); low divide between E & W Stone Cabin Valleys, 42 mi 57° from Tonopah, near 1971 Bench Mark of 6225 ft, small outcrops of whitish & grayish tuffaceous sedimentary materials, Lat. N $38^{\circ} 23' 56''$, Long. $116^{\circ} 34' 37'' W$, 27 June 1979, Goodrich 12987 (LA); 9 mi NW of Tonopah, 4500 ft, T4N, R41E, White & Neese 151 (BRY).

Mentzelia candalariae occurs in western Nevada (Fig. 2) in Shadscale and Sagebrush Zones of the Lahonton Basin and Tonopah floristic sections as they are outlined by Cronquist, et al. (1972). Within these vegetation zones M. candalariae occurs only on sites where the vegetation is broken by topographic or edaphic anomalies such as loose gravel slopes and clay hills. The popula-

tions are thus local and discontinuous. The southern populations occur at elevations between 4500 and 5500 ft while the northern ones are between 3800 and 4500 ft, but notable exceptions are the two collections by Goodrich which occur at 6225 and 6700 ft. No information about associate plants or surrounding vegetation are given by Goodrich but when the two localities are plotted on USGS 1:250,000 topographic map Tonopah, Nevada 1962, they fall outside the green overprint that represents "woods-brushwoods." Thus it appears that these high elevation populations are in Sagebrush and not Juniper Woodland.

We have grown two individuals of M. candelariae in the greenhouse at UCLA from seed collected from the type locality. Chromosomes of one of these plants (3164-1) were observed at metaphase_I where 11 pairs were observed in several cells, and at anaphase_I where segregation was 11 and 11. These plants were selfcompatible and autogamous, produced 86% good pollen, and set an average of 50 seeds per capsule. Individual 3164-2 was crossed as the seed parent with M. albescens (Thompson 3549, Alpine, Texas). The M. albescens parent plant, also selfcompatible, had 96% good pollen and set 81 seeds per capsule. Two capsules from the crosspollination formed 29 and 21 seeds. These seeds germinated readily and the four F₁ individuals grown to maturity were intermediate in morphology. For example, the 5 petals of M. candelariae and the 10 petals of M. albescens result in F₁ flowers with 5 petals and 5 petaloid stamens. The F₁ plants are sterile producing an average of 11% good pollen and no seeds. Thus there is no barrier to crossability between M. candelariae and M. albescens and the F₁ hybrid is vigorous but the interspecific exchange of genetic material is blocked by the sterility of the F₁ individuals. Herbarium specimens of these hybrids are deposited at RSA.

The relationship of M. candelariae within Section Bartonia seems to be with a group of species centered around M. pterosperma. As we understand the section it is composed of about 40 species, all occurring in west-central North America with one species, M. albescens, ranging disjunctly to Argentina and Chile. Species groups within Section Bartonia are not perfectly clear but the following characteristics outline several loose species clusters: petal apex (obtuse or acute); petal outer surface (glabrous or pubescent); the whorl within the five petals (5 petals, and the flower thus with 10 petals, or 5 petaloid stamens, or 5 narrow-filament stamens, or 5 narrow staminodia, i.e. filaments without anthers); seed coat cell radial walls (straight, wavy, or sinuate); seed coat cell outer tangential walls raised with (one large, flat projection, or a few flat projections, or a mound of many papillae). Mentzelia candelariae has the following states of these characters: acute, glabrous petals; narrow filament stamens; straight radial walls; tangential walls with 10-15 papillae (Fig. 3). Mentzelia candelariae shares all but two of these character states with M. albescens and M. pumila and all but one with M.

pterosperma. In addition, M. candelariae can be hybridized with M. albescens and all four species are similar in chromosome number, $n=11$, and all are selfcompatible. In contrast, many other species of the section have either 9 or 10 pairs of chromosomes and are selfincompatible. While M. candelariae fits best in the albescens-pumila-pterosperma group, it has some important differences. M. candelariae differs from M. albescens and M. pumila in the surface of the seed coat cells and differs from these two species and M. pterosperma in having only 5 petals. Thus M. candelariae is most similar to M. pterosperma; differing in having fewer petals and also smaller, less conspicuous flowers, characters probably associated with autogamy in the small, disjunct populations of M. candelariae.

Acknowledgements

We thank James Henrickson for reviewing the manuscript and Marshall C. Johnston for providing the latin diagnosis.

Literature Cited

Cronquist, A., A. Holmgren, N. Holmgren, & J. Reveal. 1972. Intermountain Flora Vol. I. Hafner Publishing Company, Inc. New York and London.

Explanation of illustration on opposite page:

Fig. 1. Drawing of the holotype of Mentzelia candelariae. The diagram at lower right shows elements of the whorls of the flower, left to right: sepal, petal, outermost stamen, stamen - - innermost stamen, style.

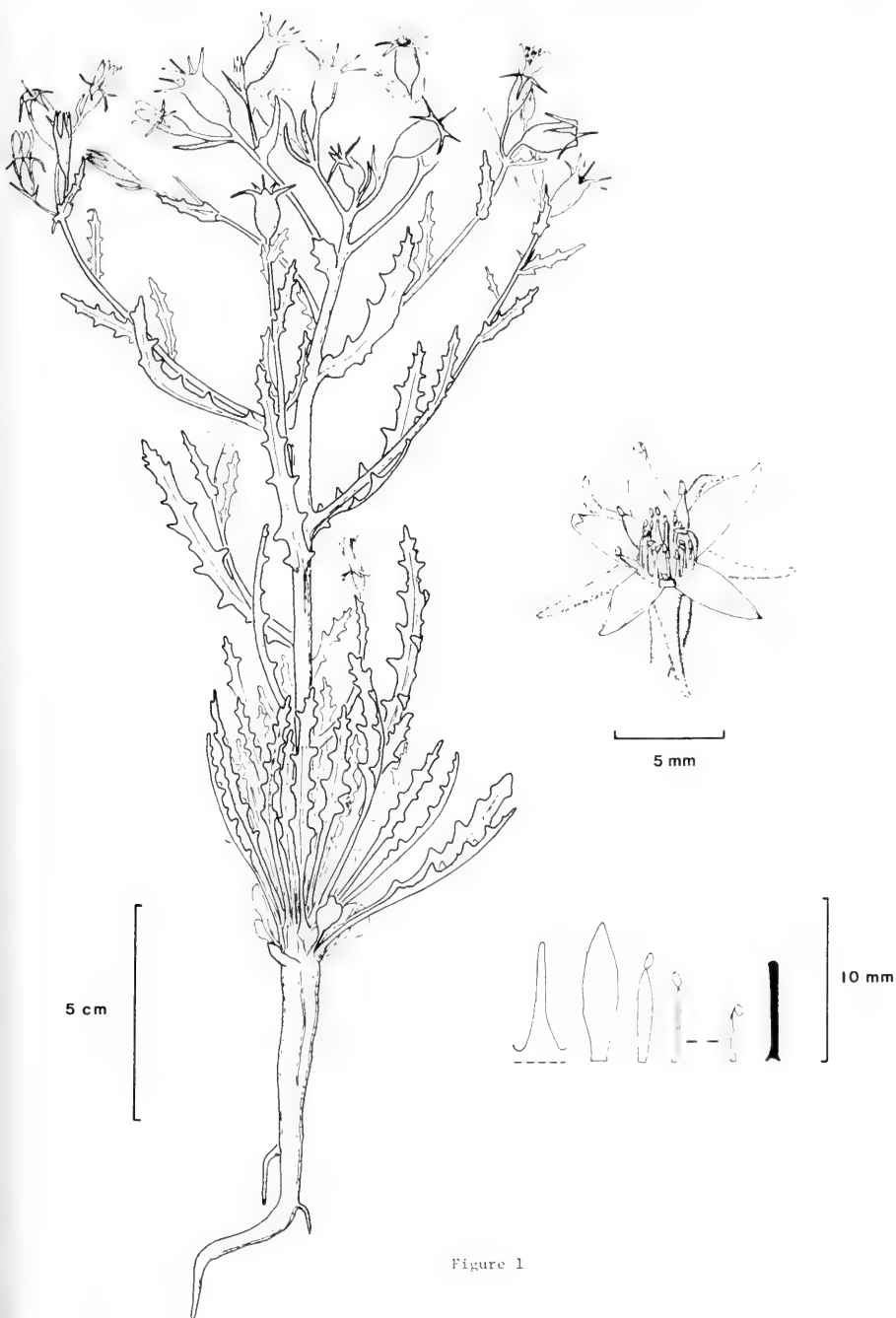


Figure 1

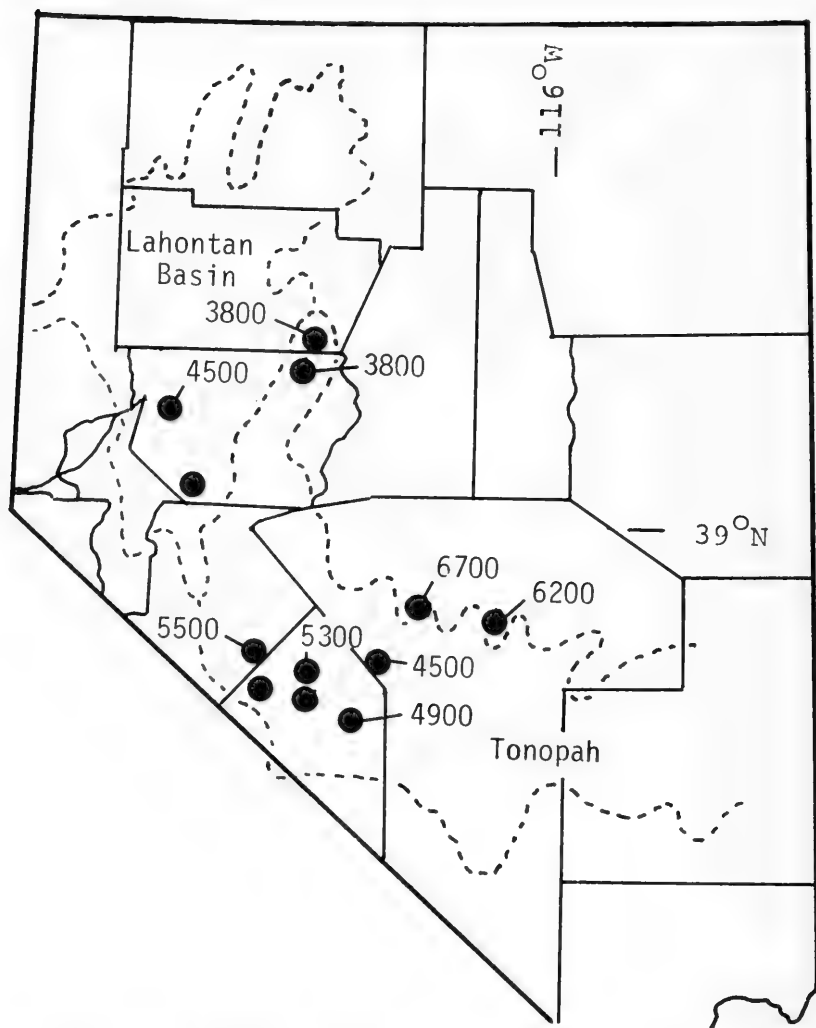


Fig. 2. The state of Nevada, USA, showing the geographical and elevational distribution of *Mentzelia candelariae*. The dotted line shows the limits of the Lahontan Basin and Tonopah Floristic Sections as shown in Cronquist, et al. 1974. Elevations are given in ft because all the collections gave elevations in ft and all the maps in use for this area are in ft.

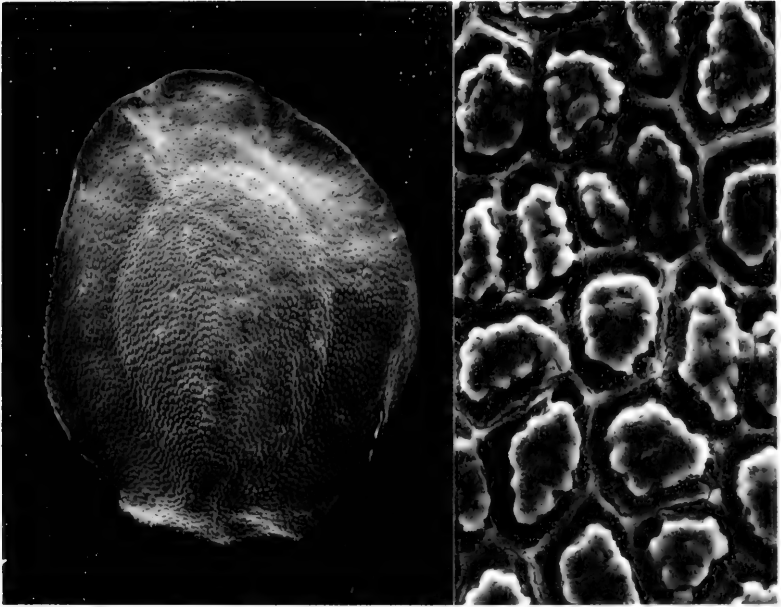


Fig. 3. Scanning electron micrographs of seeds of Montzelia candulariae. Left: Entire seed from Tiehm 6017. This seed is 3.2 mm long. Right: Seed coat cells of Tiehm 6000, 400X.

NEW COMBINATION IN ENCYCLIA

German Carnevali

ENCYCLIA PAMPLONENSE (Rchb.f.) Carnevali, comb. nov.

Epidendrum pamplonense Rchb.f., in *Linnaea* 22: 837.

1846.

- - - - -

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXV

Harold N. Moldenke

AEGIPHILA HOEHNEI var. *PANAMENSIS* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum maturis membranaceo-chartaceis supra persistenter planis recedit.

This variety differs from the typical form of the species, and all other named forms of it, in having its apparently mature leaf-blades at time of flowering/fruitletting membranous-chartaceous rather than firmly coriaceous, with the upper surface permanently flat rather than conspicuously bullate.

The variety is based on Knapp & Schmalzel 1799 from a tropical wet rainforest on northwest-facing slopes 21 km. from the Transisthmica Highway on Santa Rita Ridge, altitude 400--500 m., 9°26' N., 70°38' W., Colon, Panama, collected on October 21, 1981, and deposited in the Lundell Herbarium at the University of Texas. The collectors describe the plant as a shrub or liana, 3--4 m. tall, with green (immature) fruit.

LANTANA COSTARICENSIS var. *PUBESCENS* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus densiuscule pubescentibus recedit.

This variety differs from the typical form of the species in having the lower surface of the leaf-blades rather densely pubescent with subappressed hirtulous hairs.

The type of the variety was collected by W. A. Haber (no. 399) in secondgrowth on the rocky Pacific slope below Monteverde, Puntarenas, Costa Rica, at 1100 m. altitude, on August 15, 1980, and is deposited in the herbarium of the Missouri Botanical Garden at Saint Louis. The collector describes the plant as a shrub, the corollas white with a yellow throat, and the fruit (which he erroneously refers to as a "berry") also white.

ADDITIONS TO THE ORCHID FLORA OF CERRO MARAHUACA

Germán Carnevali and Julian A. Steyermark¹

The collections obtained by Dr. Julian A. Steyermark, in October, 1983 from Cerro Marahuaca, Territorio Federal Amazonas of Venezuela, resulted in a number of species new to this mountain, as well as for the Territorio Federal Amazonas, and, in addition, a species new to science, the description of which follows.

SCAPHYLOTTIS MICHELANGELIORUM Carnevali & Steyermark, sp. nov. (figure 1)

Herba epiphytica, pro genero parva 7 cm alta. Rhizoma abbreviatum. Pseudobulbi fusiformes vel subcylindrici stipitati 2-4.5 cm longi, apice bifoliati. Folia lineari-oblonga, apice bilobata 3.5-4.5 cm longa 0.3-0.35 cm lata. Inflorescentia uniflora solitaria, pedunculo fere nullo. Ovarii pedicellus 0.4 cm longus, ovario vaginis 3-4 scariosis imbricatis oblecto. Flores parvi purpurei. Sepala trinervula. Sepalum dorsale anguste obovato-ellipticum obtusum 0.38 cm longum 0.17 cm latum. Sepala lateralia similia sed valde obliqua et leviter breviora⁺. Petala uninervada spatulata obtusa acutiuscula 0.32 cm longa 0.15 cm lata. Labellum obovatum truncatum leviter emarginatum paullo panduratum, basi callis duobus rotundatis 0.35 cm longis 0.15 cm latis munitum, ad pedem columnae continuum. Columna subteres alis tenuibus membranaceis continuis instructa, pedi brevi 0.32 cm longa. Pollinia 4.

⁺ cum pede columnae prominentiam exigua formantia.

Small epiphytic herb 7 cm tall. Rhizome short, pseudobulbs cylindrical to subfusiform, erect, 2-4.5 cm long when mature, apparently not overlapping, 1-2-foliate apically, basally shortly stipitate. Leaves coriaceous, subopposite, erect-spreading, linear-oblong to linear, 3.5-4.5 cm long, 0.3-0.35 cm wide, bilobed at the apex with a minute mucro in the depression of the sinus. Inflorescence 1-flowered, solitary (possibly also fasciculate), arising from the apices of the secondary stems. Peduncle nearly absent, 0.1 cm long. Peduncle and ovary pedicellate, covered with 3-4 scarious, imbricate, oblong to oblong-obovate,

¹ Instituto Botanico, Herbario Nacional, Caracas Venezuela

acuminate sheaths 0.5 cm long, 0.2 cm wide. Ovary pedicellate, subterete, tricostate, 0.4 cm long. Flowers small for the genus, purple, slightly open, erect-spreading. Dorsal sepal trinerved, narrowly obovate-elliptic, obtuse, 0.38 cm long, 0.17 cm wide. Lateral sepals 3-nerved, obovate-elliptic, oblique, obtuse to acutish, 0.32 cm long, 0.16 cm wide, with a relatively conspicuous protuberance at the base. Petals 1-nerved, narrowly obovate-elliptic, oblique, obtuse to acutish at the apex, 0.37 cm long, 0.12 cm wide. Lip in general aspect obovate, rounded, emarginate and minutely apiculate, attenuate basally, slightly geniculate in natural position, slightly pandurate at the middle, 3.2 mm long, 1.5 mm wide, lateral margins raised in natural position; disk with 2 semihemispherical shallow ridges in the basal half. Column thin, slightly incurved, with 2 slender membranous wings 2 mm long along the length. Pollinia 4.

Type collection: VENEZUELA: Territorio Federal Amazonas: faldas del Cerro Marahuaca, alt. 1550 m, 13-14 oct 1983, Julian A. Steyermark 129650 (VEN, holotype).

This small species is characterized by having the lip continuous with the column, imbricate bracts covering the pedicellate ovary, and the semihemispherical ridges in the basal part of the disk of the lip. Because of its lip continuous with the column (not articulate with it), it is related to Scaphyglottis bicornis (Lindl.) Garay (Scaphyglottis aurea (Rchb.f.) Foldats), but that species has larger flowers with differently shaped perianth segments and a much more geniculate lip. Scaphyglottis bicornis was placed in the genus Tetragamestus Rchb.f. and our new species would fall there if that genus were considered valid. The separation of Tetragamestus from Scaphyglottis Poepp. & Endl., based on the absence of a columnar foot in Tetragamestus, does not appear to be a significant character, since it has apparently evolved independently several times within the Scaphyglottis complex. The type species of the genus Tetragamestus, T. modestus Rchb.f., does not appear to have close affinity with T. aureus, but is closely related to the other species typical of the genus Scaphyglottis. On the other hand, T. aureus shows a real affinity with the genus Hexisea Lindl. because of the character of the geniculate lip continuous with the column, and particularly with H. geniculata Ames & C. Schweinf. of Central America, and constitutes an intermediate stage between Hexisea and Scaphyglottis. Our species is much closer to the classic concept of Scaphyglottis

and for this reason it is placed here in this genus.

Scaphyglottis michelangeliorum somewhat resembles S. bradeorum Schltr. of Costa Rica, but that species has larger flowers with a slightly 3-lobed lip, and is a more robust taxon. Also, S. michelangeliorum approaches S. prolifera Cogn. which has a different lip without ridges and only slightly oblique lateral sepals.

The species is dedicated to Armando and Fabian Michelangeli of the Terramar Foundation, through whose efforts in organizing the expedition to Cerro Marahuaca, it was possible to collect this orchid.

The orchid collections obtained from Cerro Marahuaca during October, 1983, also yielded other interesting records. Two of them, Pterichis acuminata Schltr. (Steyermark 129565) and Epidendrum klotzschianum Rchb.f. (Steyermark 129474), merit special comments from the phytogeographical viewpoint. The first mentioned species belongs to a genus considered restricted to the high Andes, including the páramos. This is the first record for the genus outside of the Andes and Coastal mountains of Venezuela. The second species mentioned is likewise characteristic of cloud forests and subpáramos of the Andes and only exceptionally found in the Venezuelan Coastal mountains in stations above 2000 meters.

These two records illustrate the at present unexplainable botanical connection existing between the flora of the high Andes and that of Pantepui without supporting geological data. Numerous examples of this connection are known in various families of plants, but in the Orchidaceae, such species may be mentioned as Encyclia pamplonense (Rchb.f.) Carnevali, Epidendrum attenuatum Lindl., E. imthurnii Ridl., E. schlimii, Maxillaria alticola C. Schweinf., M. aurea (P. & E.) L.O. Wms., M. grandiflora (H.B.K.) Lindl., Otoglossum arminii (Rchb.f.) Garay & Dunst., Pleurothallis moritzii Rchb.f., and P. samacensis Ames.

Additional records of orchids found on the expedition to Cerro Marahuaca in October, 1983, which further substantiate this Andean-Guayana Highland connection, include the following:

MYOXANTHUS SPECIOSUS (Luer) Luer

Steyermark 129453. This species, cited as Pleurothallis exasperata Lindl. in the Flora de Venezuela by Foldvik, is known from the summits of sandstone table mountains, the Venezuelan Coastal Cordillera above 1800 meters altitude, and from the Ecuadorian Andes. The collection cited here constitutes the first record for Territorio Federal Amazonas.

EPIDENDRUM PACHYPHYTON Garay

Steyermark 129603. This species, originally described from the departments of Antioquia and Risaralda of the Colombian Andes, was later collected from Cerro Jaua and Cerro Venamo of Estado Bolívar, Venezuela Guayana. The present record is the first one obtained from a table mountain of the Territorio Federal Amazonas.

ONCIDIUM SANCTI-PAULI Kränzl.

Steyermark 129620. Described from the Colombian Andes, it was later found on Cerro Venamo of the Venezuelan Guayana in the southeastern portion of Estado Bolívar. This is the first record of the species for the Territorio Federal Amazonas.

BRACHIONIDIUM PARVUM Rolfe (figure 2)

Steyermark 129512. This species was described originally from material collected in the Antilles. In Venezuela it was later collected on Cerro Duída, adjacent to Cerro Marahuaca. Now, as would be expected, it has been found on one of the talus forested slopes of Cerro Marahuaca at an altitude of 1500 meters. Since this taxon has not been previously illustrated either in the Flora de Venezuela by Foldats or in Venezuela Orchids Illustrated by Garay and Dunsterville, we provide here an excellent drawing executed by the eminent artist, Bruno José Manara.

BIBLIOGRAPHY

- Ames, O. (1937). Orchidaceae, in P.C. Standley, Fl. Costa Rica, Field Mus. Nat. Hist. Bot. 18(1): 197-306.
- _____ & D.S. Correll (1952-53). Orchids of Guatemala, Fieldiana, Bot. 26: 1-727.
- Britton, N.L. & C. F. Millspaugh (1920). The Bahama Fl. 81, 98.
- Cogniaux, A. (1893-1906). Orchidaceae, Fl. Bras. 3 (4-6).
- Dressler, R. L. (1964). Nomenclatural Notes on the Orchidaceae II. Taxon 7: 246-249.
- Dunsterville, G.C.K. & L.A. Garay (1954-1976). Venezuelan Orchids Illustrated, 6 vol.
- Dunsterville, G.C.K. & L.A. Garay (1979). Orchids of Venezuela: an Illustrated Field Guide, 3 vol.
- Hoehne, F.C. (1940-1953). Orchidaceae in Fl. Brasilica 12, parts 1, 2, 6, and 7.

EXPLANATION OF FIGURE 1.

- A- Habit.
- B- Flower, natural position.
- C- Lip and column, without anther.
- D- Lip and tepals, flattened.

EXPLANATION OF FIGURE 2.

- A- Habit and flower.
- B- Lip, two views.
- C- Lip and column.
- D- Lip and tepals, flattened.

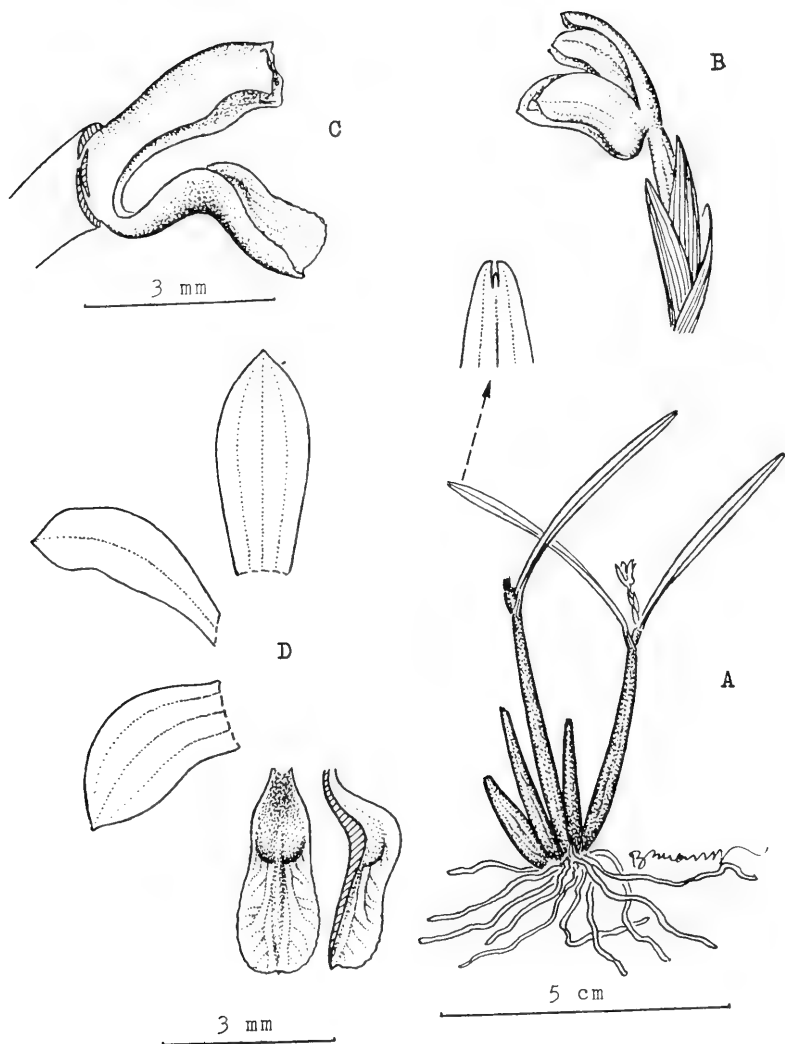


Figure 1
SCAPHYGLOTTIS MICHELANGELIORUM

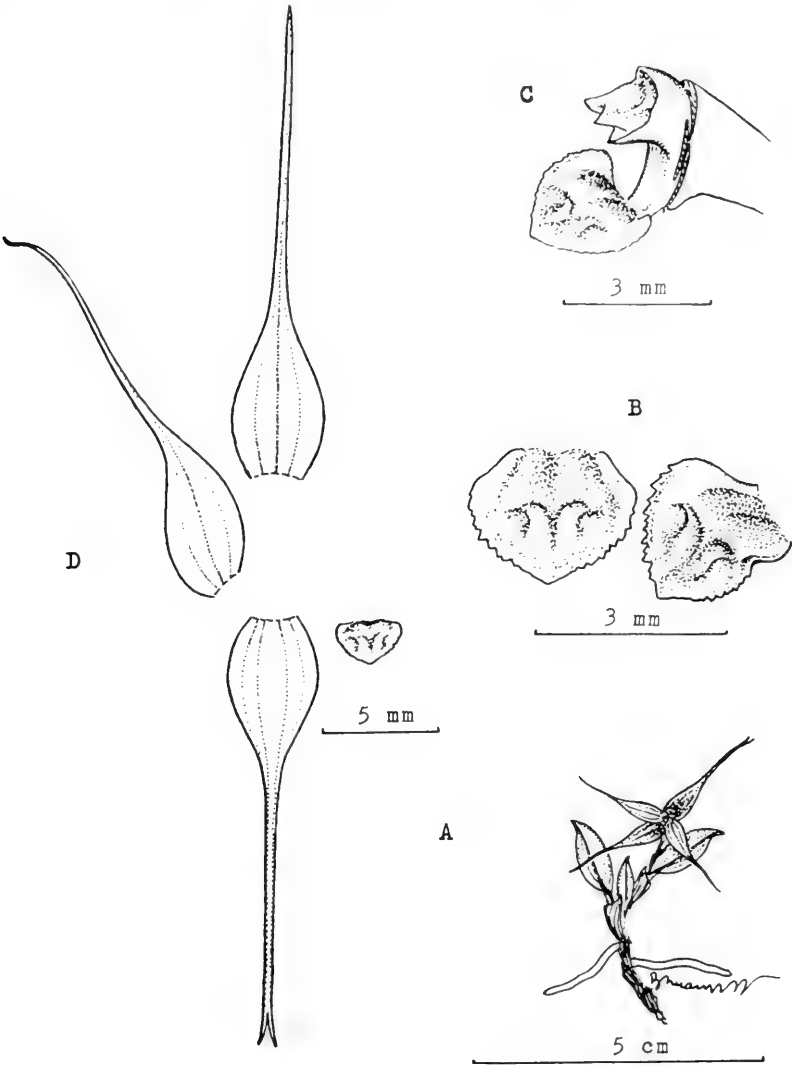


Figure 2
BRACHIONIDIUM PARVUM

DOS NOMINA NOVA PARA ESPECIES AMERICANAS DE DIOSCOREA

F.Ayala ¹

Herbarium Amazonense

Universidad Nacional de la Amazonía Peruana

Apt.421. Iquitos - Perú

Durante mis estudios en la revisión del Género Dioscorea para Flora Neotrópica he encontrado a la fecha dos nombres específicos que por haber sido previamente publicados son inválidos y deben ser reemplazados.

Dioscorea ravenii F.Ayala, nom.nov.

Dioscorea grisebachii Britt.ex León, Contr.Ocas.Mus.Hist.Nat.Col. de la Salle 8 : 321. 1946, no Kunth.

Dioscorea linearis Griseb., Cat.Pl.Cubens. : 251. 1866; también en R.Knuth, Pflanzentr.IV.43 : 168. 1924. Tipo : Cuba, localidad no citada; C.Wright 3254 (Tipo B, destruido; lectotipo MO), no Colla.

Existe ya Dioscorea grisebachii Kunth publicada en Enum.Pl. V : 853. 1850, también en R.Knuth, Pflanzentr.IV.43 : 80. 1924, ubicada en la Secc.Hyperocarpa Uline, por lo tanto D.grisebachii Britt.ex León se invalida. Cuando León propuso D.grisebachii para reemplazar a D.linearis él también falló al reconocer que el epíteto había sido ya ocupado, por lo tanto es necesario proponer otra vez otro nomen novum.

Dioscorea schubertii F.Ayala, nom.nov.

Dioscorea elegans R.Knuth, Fedde Rep.Sp.Nov.28 : 83. 1930, no Ridley. Tipo : Perú, Departamento de Cuzco, Provincia Quispicanchis, Marcapata, 2800 m.s.n.m, en matorral; A.Weberbauer - 7815, planta masculina (Tipo B, destruido; lectotipo US; isolecotipo F).

Dioscorea elegans Ridley ex Prain et I.H.Burkill ya fue publicada en Kew Bull.: 65. 1925, ubicada en la Secc.Enantiophyllum Uline, por lo tanto D.elegans R.Knuth se invalida. Dado que el espécimen de Berlín fue destruido durante la Segunda Guerra Mundial, he seleccionado el duplicado de US como lectotipo.

1. Este trabajo ha sido posible gracias a la beca otorgada por el Jardín Botánico de Missouri, USA y también gracias a la asistencia del Instituto de Investigación de la Amazonía Peruana (IIAP). Iquitos - Perú.

SOLANUM VENATORIS (SECT. PETOTA)
A NEW SPECIES FROM BOLIVIA

C. Ochoa

Department of Taxonomy of the International
Potato Center, P.O. Box 5969, Lima, Perú

Solanum venatoris Ochoa sp. nov.

Herbaceum, tuberiferum. Plantae 30-40 cm altae, caules erecti, gracili, 2.5-3.5 mm crassi, plerumque simplici, sparsim pilosi, pilis difficulter manifesti. Caules anguste alati, alae rectae. Stolones plus quam 1 m longi, 1.5-2.0 mm crassi, albidi; tubercula parva 2.0-2.5 cm diam., rotunda, alba. Folia imparipinnata, brevia lataque, 10.5-13.0 x 8.0-9.5 cm petioli 1.0-2.5 cm longi, folia 2-3-juga, 0-4 foliolis interjectis instructa, rarissime 4-juga, foliolis interjectis 6 vel plus. Foliola supra viridia vel obscurius viridia et sparse pilosa, subtus dilute viridia pilis brevibus et densioribus praedita. Foliolum terminale caeteris sensim majus atque latius, 5.5-6.2 x 3.2-4.0 cm, elliptico-lanceolatum, apice acuminatum, basi rotundatum vel asymmetricice rotundatum. Foliola lateralia elliptico-lanceolata, apice et base tam quam foliolum terminale, petioluli 1.5-3.0 mm longi, foliola interjecta 1.5-6.0 x 1.0-3.5 mm. Foliola pseudostipulacea parva anguste subfalcata usque ad triangulariter-lanceolata, 2.5-4.0 x 1.5-2.0 mm. Inflorescentia cymoso-paniculata, 5-6-flora, pedunculus 5 cm longus, basi 1.5 mm crassus o sparse pilosus, dilute viridus tam quam pedicelli et calyx; pedunculus ad 1/3 superum vel prope calycem articulatus, pedicellus superior 5-6 mm longus, inferior 12-30 mm longus. Calyx 8-9 mm longus, lobi anguste elliptico-lanceolati, in acumina attenuati, acumina recurva, angusta atque acuta 5.5-7.0 mm longa. Corolla parva, rotata vel pentagona, alba 2.0-2.5 cm diam, stella viride-flava. Antherae anguste lanceolatae 5.5-6.0 mm longae, basi cordatae. Filamenta glabra 0.5-0.8 mm longa. Stylus 10 mm longus 2/3 inferioris papillis obtectum, stigma parvum, styli apice vix crassius. Baccae globosae, virides, difficulter 10 mm diam. Ad seriem tuberosa pertinet, numerus cromosomatum $2n=2x=24$.

Typus: BOLIVIA, Department La Paz, province Inquisivi in itinere Quime-Inquisivi, 2500 m alt. Crecit inter frutices et ad margines silvarum. Martius 1978, C. Ochoa 11917. Holotypus: Herb. Ochoanum (OCH). Isotypi: CIP, US.

Paratypi: BOLIVIA, Department Santa Cruz, province Valle Grande, prope Alto Grande, 2750 m alt., in itinere Valle Grande-Pucará, C. Ochoa et A. Salas 15554 (CIP, OCH, US).

Omnibus, Solana tuberifera sponte crescencia venatores, et qui haec loci visitaverunt, ex toto corde dedico.



Solanum venatoris Ochoa. Holotypus
OCH 11917, ca $\times 1/3$

A NEW SPECIES OF *ZAMIA* L. (ZAMIACEAE, CYCADALES) FROM CHIAPAS, MEXICO.¹

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In the course of ongoing revisionary studies of meso-American *Zamia*, I observed a strikingly different group of plants in the research collection at Fairchild Tropical Garden. Upon further investigation of their morphology and karyotype, I concluded that these distinct plants deserved specific status.

Zamia splendens Schutzman, sp. nov.

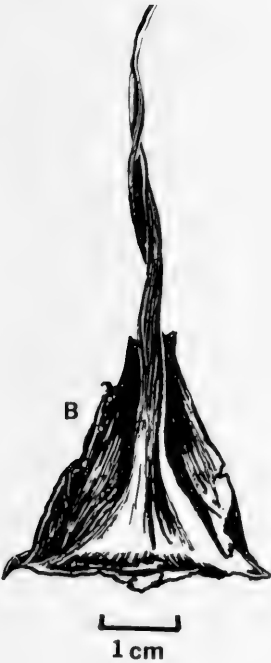
Haec species *Z. purpurea* Vovides, Rees et Vásquez-Torres affinis sed caudici interdum ramoso, cataphyllis longis angustis et irregulariter tortilibus, petiolis foliorum aculeatis vel non aculeatis, foliolorum numeris 4-10 paribus, iunctura foliolorum ad rhachem latissima, nervis non elevatis, apicibus acutis ad abrupte acuminatis, apicibus megastrobilorum proboscideibus, microsporangiiis 14-20 in quoque microsporophyllo.

Herbaceous perennial plant, 0.3-1.0m, in cultivation to 2m tall. **Stem** greyish, subterranean, occasionally dichotomously branched, varying in diameter; **cataphylls** 3-10 cm long, triangular and irregularly twisted, chartaceous, fragile and eventually deciduous. **Leaves** numbering 2-4 per apex, held in a gracefully arching crown; often emerging bright red; petiole/rachis robust, widest at its point of attachment to the caudex, degree of armament variable; prickles when present to 0.4mm in length, decreasing in frequency toward the rachis; varying from densely puberulent to glabrous; **leaflets** 8-20, very stiff and coriaceous, opposite to subopposite; 9-35 cm long, 3-6.5 cm wide; somewhat oblique, long-elliptic through oblong to oblanceolate, serrulate-denticulate in the apical 2/3-4/5 of their length, the teeth becoming more frequent toward the acute to abruptly acuminate apex; denticulations 0.5 to 2.5mm long; margin subrevolute; base attenuate to cuneate-attenuate, flaring out to form a 10-15mm zone of articulation with the rachis; both surfaces bright green, adaxial with an exceptionally high gloss; veins visible but not elevated, 1.5-2.5mm apart. **Megasporangiate strobili** subglobose or ellipsoid with a narrowly conic apical projection, ca. 7cm long, 4.5cm in diameter, at first light brown, tomentulose, later dark green and glabrescent; **megasporophylls** hexagonal with smooth convex surface. **Microsporangiate strobili** two or more per stem apex, conic, light brown, tomentulose, 4-5cm long and 1.1-1.3cm in diameter, declinate or decumbent on 8-14cm long peduncles; **microsporphylls** hexagonal, in regular orthostichies, with relatively smooth, dome-shaped apices upon which only a slight hexagonal outline is visible; **microsporangia** numbering 14-20 per median microsporophyll, fewer in basal and apical sporophylls. **Seeds** obovoid, to 15mm long and 7mm wide, sometimes slightly and irregularly 3-lobed, sarcotesta pink to scarlet at maturity. **Chromosome number** $2n = 16$.

TYPE: *J. Watson* 1870, specimen from cultivated plants at Fairchild Tropical Garden, accession number FTG 76-1046; collected by Mr. Merrill Rogers (Holotype: NY isotypes, FLAS, FTG, MEXU). TYPE LOCALITY: Mexico, CHIAPAS, 18km along the road from Mexican highway 190 to Malpaso, frequent on shaded rain forest floor with *Anthurium leuconeurum* Lem., occasionally out to the roadcut. Altitude approximately 500m.



FIGURE 1. *Zamia splendens* Schutzman (Illustration of living plant at the University of Florida). A, growth habit; B, cataphyll; C, immature microsporangiate strobilus; D, immature microsporophylls, ab- and adaxial sides; E, mature microsporophyll; F, immature megasporangiate strobilus; G, immature megasporophylls, side and front view; H, seed.



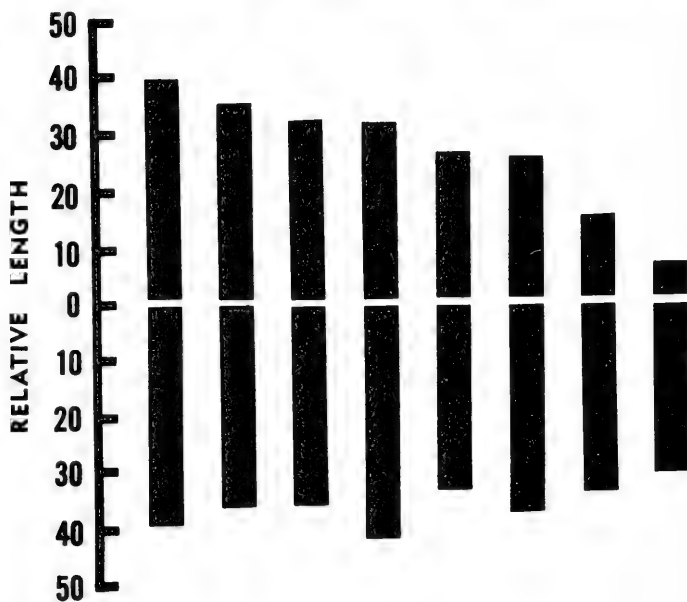
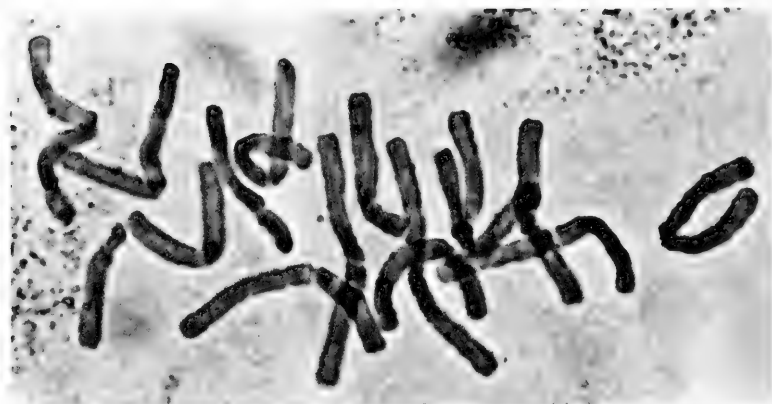


FIGURE 2. Chromosomes and haploid idiogram of *Z. splendens*. Lengths are shown in relative units. Length of the diploid complement is standardized to 1000 units; the haploid total is 500 units.

DISTRIBUTION: Known in cultivation from locations including the type locality, Cintalapa de Figueroa and Tuxtla Gutiérrez in northwestern Chiapas; and San Jerónimo Tulijá in the Lacandona forest of northeastern Chiapas. In the vicinity of Tuxtla Gutiérrez, plants were reportedly collected at an altitude of approximately 1500m.

ADDITIONAL SPECIMENS EXAMINED: San Jerónimo Tulijá, Mpio. de Yajalón, J. Chavelas P.; G. Alanís; M. Martínez #ES-3015 (ENCB).

Zamia splendens (FIGURE 1) is most closely affiliated with *Z. purpurea* Vovides, Rees & Vásquez-Torres and *Z. skinneri* Warsz. Distinguishing it from both are its occasionally branching stems; very long and irregularly twisted cataphylls; thick, glossy, and heavily cuticularized leaflets, which when ontogenetically adult have extremely wide zones of articulation with the rachis and lack the prominent, elevated veins of *Z. skinneri* and *Z. purpurea*; and narrow, conic, projecting apices of megasporangiate strobili.

The new species resembles *Zamia purpurea* and differs from *Z. skinneri* in its possession of a wholly underground stem, though Dressler (unpub. data) reports both subterranean and arborescent stemmed populations of *Z. skinneri*. Armament and pubescence of petiole/rachis of *Z. skinneri* and *Z. splendens* are variable. *Zamia purpurea* is reported as possessing armed petioles and initially tomentulose petiole/rachis. This taxon may prove to be more variable once further population data are gathered. On the basis of specimen annotation (D. W. Stevenson, pers. comm.), it appears that Vovides et. al have included material referable to *Z. splendens* within their concept of *Z. purpurea*.

At the type locality of *Zamia splendens*, leaf color at emergence is brilliant red, passes through salmon-pink to cream, and becomes bright green at maturity; at other localities leaves often emerge light green and merely darken to their mature bright green color. The emergent leaf color of *Z. purpurea* as stated in the original description (VOVIDES ET AL., 1983) is brown to brownish-green. Additionally, the leaflets of *Z. purpurea* are darker green above and paler beneath, whereas both surfaces of *Z. splendens* are the same shade of green, and *Z. skinneri* may exhibit either condition. Leaflet apices are acute in *Z. purpurea*, but acute to acuminate in *Z. skinneri* and *Z. splendens*. Emergent leaf color of *Z. skinneri* is usually green, though plants of reported Ecuadorean origin (T. Nance, pers. comm.) often emerge bright red, fading to pink before developing their ultimate green color.

Additional features distinguishing *Zamia splendens* may be found in its reproductive structures. Habit of microsporangiate strobili in the new species appear distinctive; the declinate or decumbent microsporangiate strobili contrast markedly with those of *Z. skinneri*, which are erect; reproductive material of *Z. purpurea* has not been seen, but the illustration in its original publication (VOVIDES ET AL., 1983) implies the same erect habit as is found in *Z. skinneri*. Shape of micro- as well as megasporophylls in both *Z. splendens* and *Z. purpurea* are convex and rounded, contrasting with the raised or otherwise pronounced hexagonal definition seen in *Z. skinneri*. In *Z. splendens*, microsporangia number between 14 and 20 per microsporophyll; this differs greatly from the reduced number (ca. 4) reported by Vovides et. al. for *Z. purpurea*. The illustration in Schuster (1932, p. 140, FIG. 19f. c. k) suggests sizable variation in microsporangial number of *Z. skinneri*, but no mention is made in the text as to whether this variation was exhibited between sporophylls of the same cone, different cones on the same plant, cones of different plants, or cones from plants at different locations. He may have been referring only to the reduced number of microsporangia in apical or basal sporophylls common to many cycads (CHAMBERLAIN, 1935). Costa Rican specimens of *Z. skinneri* possess a minimum of 12 and usually more than 20 microsporangia on their median sporophylls (pers. obs.).

Zamia splendens and *Z. purpurea* stand apart from *Z. skinneri* on the basis of diploid chromosome number. *Zamia splendens* (FIGURE 2) has $2n = 16$, the same as reported by Vovides (1983) for *Z. purpurea*. Norstog (1980), however, has reported $2n = 18$ or 22 for *Z. skinneri*.

Though diploid numbers are identical, karyotype morphology may be used to distinguish *Z. splendens* from *Z. purpurea*. Vovides (1983) reported 12 metacentric and 4 acrocentric chromosomes, one of the acrocentric pairs with a heterochromatic band in the short arm. The diploid karyotype of *Z. splendens* appears to be 8 meta-, 4 submeta-, 2 acro- and 2 subtelocentric chromosomes (Figure 2 shows the haploid idiogram). Chromosomal rearrangements may be implicated in a discussion of phylogenetic relationships between the two taxa; this subject is currently under investigation.

In comparison with other Mexican taxa such as *Z. fischeri* Miq., *Z. loddigesii* Miq., and *Z. furfuracea* L.f., *Z. splendens* may be distinguished by its cataphyll morphology, emergent leaf color, leaflet size and shape, thickness, surface texture and articulation with the rachis, small mega- and microsporangiate strobili, habit of microsporangiate strobili, and shape of sporophylls. These same features, as well as the subterranean and occasionally branching nature of the stem will help distinguish it from other meso-American taxa such as *Z. acuminata* Oersted ex Dyer, *Z. fairchildiana* L.D. Gómez., *Z. obliqua* A. Braun, *Z. muricata* Willd., *Z. pseudoparasitica* Yates, and *Z. tuerckheimii* Donn. Sm.

In conclusion, the morphological and chromosomal characteristics exhibited by this group of Chiapan *Zamia* populations are adequate to identify them as belonging to a species distinct from previously described Mexican and other meso-American zamias. The specific epithet of this handsome species calls attention to its striking leaves, which have a highly polished, shining appearance.

LITERATURE CITED:

- CHAMBERLAIN, C.J. 1935. Gymnosperms: Structure and evolution. University of Chicago Press, Chicago.
- NORSTOG, K. 1980. Chromosome numbers in *Zamia*. *Caryologia* **33**: 419-428.
- SCHUSTER, J. 1932. Cycadaceae. In: das Pflanzenreich, IV, i; A. ENGLER, ed.: pp. 1-168. Englemann, Leipzig.
- VOVIDES, A. P. 1983. Systematic studies on the Mexican Zamiaceae. I. Chromosome numbers and karyotypes. *Amer. J. Bot.* **70**: 1002-1006.
- _____, J. REES & M. VÁSQUEZ-TORRES. 1983. *Zamia purpurea*. In: VOVIDES, A. P. Flora de Veracruz - Zamiaceae, Fascículo **26**: 28-31. Instituto Nacional de Investigaciones sobre Recursos Bióticos, Xalapa, Veracruz.

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A new species of Chamaecrista sect. Absus

(Caesalpinaceae) from Bahia, Brazil

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Among Brazilian Leguminosae communicated by Dr. G. Hatschbach (MBM) we have come across an undescribed species of Chamaecrista. It should be interpolated into our monographic summaries of the genus at Mem. New York Bot. Gard. 30: 177 (following species no. 76). 1977 and op. cit. 35: 654 (following species no. 78). 1982. Chamaecrista (sect. Absus ser. Rigidulae) rupestrium Irwin & Barneby, sp. nov., habitu notulisque multis Ch. multipenni (I. & B.) I. & B., procul in prov. Minas Gerais centrali obvia affinis, sed stipulis setiformibus 4-9 (nec subulatis 0.4-2) mm longis, foliolis utrinque villosulis (nec glabris), necnon inflorescentia alabastrisque parce villosulis eglandulosi (nec viscoso-setosi) diversa. Notare licet Ch. sincoranam (Harms) I. & B., etiam in rupestribus elatis Bahiae centralis indigenam, a nostra foliis elongatis angustis, foliolis numerosis 12-28 (nec 9-13)-jugis, stipulis abbreviatis caducis racemisque laxis distantius affinem esse. BRAZIL. Bahia: in campo rupestre \pm 1100 m, environs of Rio de Contas (13° 35' S, 41° 50' W), 16.V.1983 (fl), G. Hatschbach 46439. Holotypus, MBM 81734; isotypus, NY.

Erect shrubs 2 m with stiff defoliate trunk and densely leafy hornotinous branchlets terminating in a simple condensed raceme or compact panicle of racemes shortly emergent from foliage, the young stems densely gray-villosulous with fine spreading and \pm entangled eglandular hairs less than 1 mm, the firm plane, richly green subconcolorous leaflets thinly loosely puberulent with shorter incurved villi, the axes of inflorescence subglabrous eglandular.

Stipules erect setiform 4-9 x 0.2-0.3 mm, thinly ciliate, persistent after fall of associated leaf.

Leaves crowded along the new stems, subhorizontally spreading 2-4 cm, the leaflets inserted 2-3.5 mm apart along slender rachis; leaflets 9-13 pairs, a little decrescent distally, the blades oblong-elliptic from asymmetrically subcordate base 7-11 x 3.5-5.5 mm, at apex obtuse but mucronulate by shortly excurrent midrib, all smooth veinless above, finely keeled dorsally by centric midrib, 3-4 pairs of secondary venules sometimes perceptibly discolored but fully immersed.

Axis of racemes 1.5-3 cm, the pedicels arising 1-2 mm apart, the solitary or 2 simultaneously expanded flowers elevated about to level of succeeding buds; bracts linear-lanceolate 2.5-3.5 mm, membranous-margined, thinly ciliate; pedicels \pm 2 cm; bracteoles like bracts but a little shorter, inserted 1.5-8 mm below calyx; flower-buds ovoid-acuminate, villosulous at base, glabrate upward; sepals ovate-acuminate 10-11.5 mm; petals (of sect. Absus) bright yellow, the longest \pm 16 mm; filaments glabrous 1.5 mm; anthers \pm

3.5 mm, the sutures densely villosulous, the connective exerted 0.2 mm; ovary white-villosulous; style 7 mm glabrous; pod unknown.

In general habit of growth, in foliage, and particularly in attitude of the leaflets, turned obliquely edgewise to the meridian, Ch. rupestrium is strongly suggestive of M. multipennis (I. & B.) I. & B., a species found in similar rupestral habitats on the heights of Sa do Espinhaço in central Minas Gerais, and appears closely related to it. The differential characters already set out in the Latin diagnosis are here recapitulated in key form.

1. Stipules subulate 0.4-2 mm; leaflets glabrous except for rare minute cilia; axes of inflorescence and sepals viscid-setose; crest of Sa do Espinhaço in lat. 19-21° S, centr. Minas Gerais.

Ch. multipennis

1. Stipules linear-setiform 4-9 mm; leaflets villosulous on both faces; axes of inflorescence and sepals thinly villosulous eglandular; w. slope of Chapada Diamantina at lat. 13° 35' S in Bahia.

Ch. rupestrium

We acknowledge with gratitude loan of the holotype of Ch. rupestrium from Museu Botânico Municipal, Curitiba, and the gift from Dr. G. Hatschbach of isotypic material.

NOTES ON THE GENUS *GMELINA* (VERBENACEAE)

Harold N. Moldenke

This is the 79th genus treated in this series of notes. It was hoped to produce a detailed monograph, but, unfortunately, this late in life makes it impractical to fulfill this announced purpose. However, it has been thought worthwhile to place on record the rather extensive bibliographic, herbarium, and field notes accumulated by my wife, Alma L. Moldenke, and myself over the past 54 years. The herbarium acronyms employed herein are the same as have been employed by me in all previous papers in this journal (and some other journals) since 1929 and are fully explained most recently in *Phytologia Memoirs* 2: 463--469 (1980) with addenda in *Phytologia* 50: 268 (1982).

GMELINA L., Sp. Pl., ed. 1, imp. 1, 2: 626. 1753; Gen. Pl., ed. 5, imp. 1, 274. 1754.

Synonymy: *Cumbulu* Rheede, Hort. Malab. 1: 75, pl. 41. 1678.

Dematha F. Herm., Mus. Zeyl., imp. 1, 3, 9, 12, & 21. 1717. *Michelia* Amman, Comment. Acad. Sci. Imp. Petrop. 8: 218--219, pl. 18. 1736 [not *Michelia* Adans., 1773, nor Houtt., 1763, nor Kuntze, 1773, nor L., 1735, 1737, & 1811, nor Th. Dur., 1773]. *Tittius* Rumpf, Herb. Amboin. 3: 38, pl. 20. 1743. *Cumbulu* Adans., Fam. Pl. 2: 527 & 546 in syn. 1763. *Lycium* Pluk. ex Adans., Fam. Pl. 2: 199 in syn. 1763 [not *Lycium* L., 1753]. *Gmelina* Willd. ex Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 45. 1824. *Gmelinia* L., ex Spreng. in L., Gen. Pl., ed. 9, 2: 481. 1831. *Cumbula* Adans. ex Steud., Nom. Bot., ed. 2, 1: 310 & 453 in syn. 1849. *Gmebina* Roxb. ex Wight, Icon. Pl. Ind. 4 (3): pl. 1470 sphalm. 1849. *Gurelina* Wight, Illustr. Ind. Bot. 2: pl. 174 sphalm. 1850. *Panel* Adans. ex Pfeiffer, Nom. Bot. 1 (2): 1468. 1874. *Ephielis* Soland., Journ. Bot. Lond. 3: 258--259. 1865 [not *Ephielis* Banks & Soland., 1838, nor Schreb., 1791]. *Cumbalu* Adans. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 666 in syn. (in part). 1893. *Gmelinia* Spreng. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 in syn. 1893. *Cumbula* Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 666 in syn. 1893. *Melina* Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 136. 1895. *Kumbalu* Adans. ex Mold., Alph. List Inv. Names Suppl. 1: 11 in syn. 1947. *Cumbulu* "Adans. (in part)" apud Bakh. & Van Steenis, Taxon 5: 81 in syn. 1956. *Cunibalu* B. D. Jacks. ex Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 309 in syn. 1966. *Gmelina* Caudhuri, Bull. Bot. Soc. Beng. 23: 123 sphalm. 1969. *Gmelia* Joshi, Indian For. 95: 152. sphalm. 1969. *Gmelia* Anon. ex Mold., Fifth Summ. 2: 523 in syn. 1971. *Gimelina* Jayas. ex Mold., Phytologia 34: 274 sphalm. 1976. *Gmellina* Kowal & Kassam, Agric. Ecol. Savan. 237 sphalm. 1978. *Smelina* Roxb. ex Mold., Fifth Summ. 2: 622 in syn. 1971.

Bibliography: Rheede, Hort. Malab. 1: 75, pl. 41. 1678; Pluk., Almag. Bot. Phyt. 1: pl. 14, fig. 4 (1691) and 5: 234, pl. 97, fig. 2, & pl. 305, fig. 3. 1700; P. Herm., Mus. Zeyl., imp. 1, 3, 9, 12, & 21. 1717; Pluk., Op. Omn. 5: 234, pl. 97, fig. 2. 1720; P. Herm., Mus. Zeyl., imp. 2, 2, 3, 9, 12, & 21. 1726; Amman, Comment. Acad. Sci.

Imp. Petrop. 8: 218--219, pl. 18. 1736; J. Burm., Thes. Zeyl. 197. 1737; Rumpf, Herb. Amboin. 1: 129, pl. 40 (1741) and 2: 124--129, pl. 39 & 40. 1741; L., Gen. Pl., ed. 2, 526 & [538] (1742) and ed. 3 ["2"], 412 & [422]. 1743; Rumpf, Herb. Amboin. 3: 38--40, pl. 20. 1743; P. Herm. in L., Fl. Zeyl., ed. 1, 103--104 (1747) and ed. 2, 103--104. 1748; L., Phil. Bot. 35. 1751; Gled., Berl. 5: 129. 1749; L., Gen. Pl., ed. 4, 413 & [451]. 1752; L., Sp. Pl., ed. 1, imp. 1, 2: 626 & 850. 1753; L., Gen. Pl., ed. 5, imp. 1, 274, [510], & 681. 1754; Stick. in L., Herb. Amboin. 9. 1754; B. Juss., Hort. Trian. 1759; L., Amoen. Acad. 4: 121. 1759; L., Syst. Nat., ed. 10, 1115. 1759; Adans., Fam. Pl. 2: 12, 199, 527, 546, & 611. 1763; L., Sp. Pl., ed. 2, 873. 1763; Gled., Syst. 175. 1764; L., Gen. Pl., ed. 6, 315 & [590]. 1764; L., Ord. Nat. 35. 1764; J. F. Gmel. in L., Syst. Nat., ed. 12, 473 (1766) and ed. 13, imp. 1, 473. 1767; L., Syst. Nat., ed. 12 rev. [=13], 1: 417. 1767; N. L. Burm., Fl. Ind. 132, pl. 39. 1768; [Retz.], Nom. Bot. 154 & [286]. 1772; J. A. Murr. in L., Syst. Veg., ed. 13, 473. 1774; Planer, Gatt. Pfl. 2: 555 & 1061. 1775; Christm., Linn. Pflanzensyst. 2: 134. 1777; Scop., Introd. Hist. Nat. 170. 1777; Reichard in L., Gen. Pl., ed. 8, 316. 1778; J. A. Murr. in L., Syst. Veg., ed. 12, 564 & 565. 1784; Gaertn., Fruct. Sem. Pl. 1: 268, pl. 56, fig. 5. 1788; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 888 & 944. 1789; A. L. Juss., Gen. Pl., ed. 1, 108. 1789; Lour., Fl. Cochinch., ed. 1, 2: 376--377. 1790; Neck., Elem. Bot. 1: 356. 1790; Schreber in L., Gen. Pl., ed. 9 ["8"], 2: 412--413 & 854. 1791; Haenke in L., Gen. Pl., ed. 10 ["8"], 2: 536 & 797. 1791; A. L. Juss., Gen. Pl., ed. 2, 121. 1791; Gis., Prael. 486. 1792; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 2, 2: 888 & 944. 1792; Lour., Fl. Cochinch., ed. 2, 2: 456--457. 1793; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 3, 2: 888 & 944. 1796; Pers. in L., Syst. Veg., ed. 15, 602. 1797; Rausch., Nom. Bot., ed. 3, 173 & 387. 1797; Vent., Tabl. Reg. Veg. 2: 319. 1799; Batsch, Tabl. Aff. Reg. Veg. 193. 1802; Roxb., Pl. Coast Coromand. 2: 32 & pl. 162. 1802; Willd. in L., Sp. Pl., ed. 4, 3 (2): 3 & 313. 1802; Poir. in Lam., Encycl. Méth. Bot. 5: 163. 1804; St.-Hil., Expos. 1: 248. 1805; A. L. Juss., Ann. Mus. Nat. Hist. Paris 7: 75. 1806; Pers., Syn. Pl. 2: 142. 1806; J. E. Sm. in Rees, Cyclop, imp. 1 [London], 16: *Gmelina* 1--5. 1810; R. Br., Prodr. Fl. Nov. Holl. 1: 512. 1810; Ainslie, Mat. Med. Hindoost., ed. 1, 94. 1813; Roxb., Hort. Beng., imp. 1, 46 & [95]. 1814; Roxb., Pl. Coast Coromand. 3: 41--42 & pl. 246. 1815; Horsfield, Verh. Bat. Gen. 8: [Med. Pl. Java] 110. 1816; Spreng., Anleit. Kennt. Gew., ed. 2, 1: 425. 1817; Pers., Sp. Pl. 3: 357--358. 1819; Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 3: pl. 542. 1819; Jack, Malay. Misc., imp. 1, 1 (1): 17--18 & App. A. 1820; J. E. Sm. in Rees, Cyclop., imp. 2 [Philadelphia], 17: *Gmelina* 1--5. 1820; Poir., Dict. 19: 114. 1821; Roth, Nov. Pl. Sp., imp. 1, 287--289. 1821; Steud., Nom. Bot., ed. 1, 888. 1821; Link, Enum. Pl. Hort. Berol. 2: 128. 1822; Blume, Cat. Gewass., imp. 1, 83. 1823; Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 4: 56. 1823; Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 45 (1824) and 2: 18. 1824; Roxb., Fl. Ind., ed. 1, imp. 1, 3: 86. 1824; D. Don, Prodr. Fl. Nepal. 104--105. 1825; Spreng. in L., Syst. Veg., ed. 16, 2: 765.

1825; Ainslie, *Mat. Med. Indica*, ed. 2, 2: 240--242. 1826; Blume, *Bijdr. Fl. Ned. Ind.* 14: 813--814. 1826; Sweet, *Hort. Brit.*, ed. 1, 1: 323. 1826; Spreng. in L., *Syst. Veg.*, ed. 16, 5 (2): 765. 1827; Reichenb., *Consp. Reg. Veg.* 1: 117. 1828; Dumort., *Anal. Fam.* 22. 1829; Loud., *Encycl. Pl.* 1123. 1829; Wall., *Numer. List* 50 ["49"], nos. 1816--1820. 1829; Bartl., *Nat. Pl.* 180. 1830; Hook., *Bot. Misc.* 1: 284. 1830; Loud., *Hort. Brit.*, ed. 1, 245. 1830; Sweet, *Hort. Brit.*, ed. 2, 417. 1830; Spreng. in L., *Gen. Pl.*, ed. 9, 2: 481. 1831; Wall., *Numer. List* 82 & [87]. nos. 1816, 1816D, 1817I, & 2654. 1831; Walp., *Nov. Act. Acad. Caes. Leopold.-Carol. Nat. Cur.* 15: 380. 1831; Cham., *Linnaea* 7: 109. 1832; Loud., *Hort. Brit.*, ed. 2, 245. 1832; Roxb., *Fl. Indica*, ed. 2, imp. 1, 3: 82--88. 1832; Wall., *Numer. List* 215, no. 6317. 1832; Piddington, *Tab. View Gen. Char.* Roxb. 106--107. 1836; Blanco, *Fl. Filip.*, ed. 1, 492--493. 1837; Bojer, *Hort. Mauriti.* 258. 1837; Endl., *Gen. Pl.* 1: 636. 1838; Dillwijn, *Rev. Hort. Mal.* 3. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; J. Grah., *Cat. Pl. Bomb.* 158. 1839; Loud., *Hort. Brit.*, ed. 3, 245. 1839; Spach, *Hist. Nat. Vég. Phan.* 9: 227 & 232--233. 1840; Meisn., *Pl. Vasc. Gen.* 2: [Comm.] 200. 1840; Steud., *Nom. Bot. Phan.*, ed. 2, 1: 310 & 453. 1840; Endl., *Enchirid. Bot.* 312. 1841; Reichenb., *Deutsch. Bot. [Repert. Herb. Nom.]* 108. 1841; Meisn., *Pl. Vasc. Gen.* 2: [Comm.] 291. 1842; Brongn., *Enum. Gen. Pl.*, ed. 1, 65. 1843; D. dietr., *Syn. Pl.* 3: 372, 610, 611, & 613--614. 1843; Jack, *Calcut. Journ. Nat. Hist.* 4: 32--43. 1843; Walp., *Nov. Act. Acad. Nat.-Cur.* 19, Suppl. 1: 380. 1843; Hassk., *Cat. Pl. Hort. Bot. Bogor. Cult.* 2: 135. 1844; Blanco, *Fl. Filip.*, ed. 2, 344--345. 1845; Voigt, *Hort. Suburb. Calcut.* 464, 470, & 473. 1845; Walp., *Repert. Bot. Syst.* 4: 97--98. 1845; Zoll. & Moritz, *Syst. Verz.* 52. 1846; Lindl., *Veg. Kingd.*, ed. 1, 664 (1846) and ed. 2, 664. 1847; Schau. in A. DC., *Prodr.* 11: 608, 628, 678--680, & 695. 1847; Hook., *Curtis Bot. Mag.* 74 [ser. 3, 4]: pl. 4395. 1848; A. L. Juss. in Orbigny, *Dict. Univ. Hist. Nat.* 13: 185. 1849; Steud., *Nom. Bot. Phan.*, ed. 2, 1: 310 & 453. 1849; Wight, *Icon. Pl. Ind. Orient.* 4 (3): 12, pl. 1470. 1849; Brongn., *Enum. Gen. Pl.*, ed. 2, 120. 1850; Walp., *Ann. Bot. Syst.* 3: 238. 1852; Wight, *Illust. Indian Bot.* 2: 217, pl. 174. 1850; Wight, *Spicil. Neilgherr.* 2: pl. 193. 1851; Wittstein, *Etymolog.-bot. Handwörterb.*, ed. 2, 394. 1852; Lindl., *Veg. Kingd.*, ed. 3, 664. 1853; W. Griff., *Icon. Pl. Asiat.* 4: pl. 443. 1854; Twining, *Illust. Nat. Ord. Pl.* 2: 104. 1855; Schnitzl., *Iconogr. Fam. Nat. Reg. Veg.* 2: 137 *Verbenac.* [2] & [3]. 1856; Buek, *Gen. Spec. Syn. Candoll.* 3: 253, 365, & 502. 1858; Miq., *Fl. Ned. Ind.* 2: 857 & 865--867. 1858; F. Muell., *Fragm. Phyt. Austral.* 4: 128. 1858; Miq., *Fl. Ind. Bat. Suppl.* 1: 242. 1860; Benth., *Fl. Hongk.* 272. 1861; Dalz. & Gibs., *Bomb. Fl.* 201. 1861; Thwaites & Hook. f., *Enum. Pl. Zeyl.*, imp. 1, 244. 1861; W. Hill, *Cat. Queensl. Woods [Lond. Internat. Exhib.]* 20. 1862; F. Muell., *Fragm. Phyt. Austral.* 3: 58. 1862; Seem., *Viti* 440. 1862; Bocq., *Adansonia*, ser. 1 [Baill., *Rec. Obs. Bot.*], 2: 90, 113, 124--127, 135--137, 154, & 157, pl. 14, fig. 1--11 (1862) and 3: 178, 180, 184, & 254--256. 1863; Bocq., *Rév. Verbenac.* 90, 113, 124--127, 135--137, 154, & 157, pl. 14, fig. 1--11. 1863; F. Muell., *Fragm. Phyt. Austral.* 3: 168. 1863; Seem., *Journ.*

Bot. Lond. 3: 258--259. 1865; Lindl. & Moore, Treas. Bot., ed. 1, 538. 1866; Seem., Fl. Vit. 189--191, pl. 45. 1866; Norlinger, Querschn. 4: 23. 1867; F. Muell., Fragm. Phyt. Austral. 6: 153. 1868; Benth. & F. Muell., Fl. Austral. 5: 33 & 64--66. 1870; Kurz, Journ. Asiat. Soc. Beng. 39 (2): 81. 1870; Kurz, Rep. Veg. Andam. App. A: 45. 1870; Lindl. & Moore, Treas. Bot., ed. 2, 538. 1870; Beddome, Fl. Sylv. S. India 172, pl. 253. 1872; Beddome, For. Man. Bot. S. India 172. 1873; Seem., Fl. Vit. 442. 1873; Brandis, For. Fl. Northw. Cent. India 3: 354 & 364--365. 1874; Pfeiffer, Nom. Bot. 2 (1): 25 (1874) and 2 (2): 1569, 1570, & 1573. 1874; Roxb., Fl. Indica, ed. 2, imp. 2, 485--487. 1874; Kurz, Prelim. Rep. For. Veg. Pegu 69--71 & App. A: xcvi--xcviii (1875) and B: 70. 1875; F. Muell., Descrip. Notes Papuan Pl., imp. 1, 2: 33 (1875) and 5: 91 & 113. 1875; R. Schomb., Fl. S. Austral. 52. 1875; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1135 & 1153--1154. 1876; Lindl. & Moore, Treas. Bot., ed. 3, 538. 1876; Scheff., Ann. Jard. Bot. Buitenz. 1: 41--42. 1876; Kurz, For. Fl. Brit. Burma 2: 252 & 264--265. 1877; Blanco, Fl. Filip., ed. 3, 2: 274, pl. 215. 1878; Gamble, List Trees Darjeel. Dist. 61 & 62. 1878; F. M. Bailey, Proc. Linn. Soc. N. S. Wales 4: 174. 1880; Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: Nov. App. 159. 1880; Gamble, Man. Indian Timb., ed. 1, xxvii, 281, 295--296, & 509. 1881; Horne, Year Fiji 269. 1881; F. Muell., First Cens. 103. 1882; J. Sm., Dict. Pop. Names Pl. 408. 1882; F. M. Bailey, Syn. Queensl. Fl. 379. 1883; Vidal, Sin. Fam. Gen. Pl. Leñ. Filip. [Introd. Fl. For. Filip.] 1: 202 & 204 (1883) and 2: 36, pl. 75, fig. E. 1883; Dymock, Veg. Mat. Med. W. India, ED. L, IX & 498. 1884; Lindl. & Moore, Treas. Bot., ed. 4, 538. 1884; C. B. Clarke in Hook. f., Fl. Brit. India 4: 561 & 581--583. 1885; For. Adm. Rep. Chota Nagpur 6 & 33. 1885; J. Keys, Proc. Roy. Soc. Queensl. 2: 48. 1885; F. Muell., Descrip. Notes Papuan Pl. 8: 46. 1885; Trimmen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 69. 1885; Vidal, Phan. Cuming. Philip. 70 & 134. 1885; Campbell & Watt, Descrip. Cat. Econ. Prod. Chutia Nagpur 52. 1886; Drake del Castillo, Illust. Fl. Ins. Mar. Pacif., imp. 1, 260 & 432. 1886; Maxim., Bull. Acad. Imp. Sci. St.-Petersb. 3: 81. 1886; Maxim., Mém. Biol. 12: 514. 1886; Vidal, Rev. Pl. Vasc. Filip. 210. 1886; F. M. Bailey, Queensl. Woods 91. 1888; Durand, Ind. Gen. Phan. 321. 1888; Hillebr., Fl. Haw., imp. 1, 340. 1888; F. Muell., Sel. Extratrop. Pl., ed. 7, 189. 1888; F. M. Bailey, Queensl. Woods 104. 1889; F. Muell., Sec. Syst. Cens. Austral. Pl. 1: 171 & 173. 1889; Maiden, Useful Nat. Pl. Austral. 549. 1889; Oliv. in Hook. f., Icon. Pl. 19: pl. 1874. 1889; K. Schum. & Hollr., Fl. Kais. Wilhelmsh. 120. 1889; Watt, Dict. Econ. Prod. India 3: 514--517. 1889; Woodrow, Gard. India, ed. 5, 418. 1889; F. M. Bailey, Cat. Indig. Nat. Pl. Queensl. 35. 1890; Collett & Hemsl., Journ. Linn. Soc. Lond. Bot. 28: 110. 1890; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 257. 1890; Greshoff, Teysmannia 1: 127. 1890; Baill., Hist. Pl. 11: 86, 94, & 111. 1891; Burck, Ann. Jard. Bot. Buitenz., ser. 1, 10: 98--99, pl. 7, fig. 5 & 6. 1891; Kuntze, Rev. Gen. Pl. 2: 507. 1891; Holmes, Bull. Pharm. 6: 109. 1892; Dymock, Warden, & Hooper, Pharmacog. India, imp. 1, 3: [iii] & 70--73. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 76, 666, 844, 1039--

1040, & 1458. 1893; Prain, Journ. Roy. Asiat. Soc. Beng. 62: 39--86. 1893; Anon., Gard. Chron., ser. 3, 15: 746. 1894; Hook. f., Curtis Bot. Mag. 120 [ser. 3, 50]: pl. 7391. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 622. 1894; König, Journ. Roy. Asiat. Soc. Straits 26: 103 (1894) and 27: 96. 1894; Koord., Meded. Lands Plant. Bogor 12: [Plantkund. Woordenb.] 90--91 & 144. 1894; Nairne, Flow. Pl. West. India 244 & 246. 1894; Roxb., Fl. Indica, ed. 2, imp. 2, 486--487. 1894; Talbot, Syst. List Trees Shrubs Bomb., ed. 1, 159, 161, & 221. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 133, 136, 138, 142, 165, 169, & 173. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1213--1214 & 1285. 1895; Maiden, Agric. Gaz. N. S. Wales 6: [287]--289 & 681. 1895; Stapf in Hook., Icon. Pl. 24: pl. 2391. 1895; Trimen, Handb. Fl. Ceyl. 3: 354--356. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 382. 1897; Ridl., Journ. Straits Med. Assoc. 5: 129. 1897; Koord., Meded. Lands Plant. Bogor 19: 559. 1898; Lindl. & Moore, Treas. Bot., ed. 5, 538. 1899; J. L. Stewart, Punjab Pl. 166. 1899; Woodrow, Journ. Bomb. Nat. Hist. Soc. 12: 359. 1899; L. H. Bailey, Cyclop. Am. Hort. 2: 654. 1900; Koord. & Valet., Meded. Lands Plant. Bat. 42 [Bijdr. Booms. Java 7]: 164 & 196--198. 1900; Raciborski, Ann. Jard. Bot. Buitenz. 17 [ser. 2, 2]: 22--24, fig. 11. 1900; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 524. 1900; F. M. Bailey, Queensl. Fl. 4: 1165 & 1177--1178. 1901; Banks & Soland., Bot. Cook's Voy. 2: pl. 238. 1901; Boorsma, Bull. Inst. Bot. Buitenz. 14: 35. 1902; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 185. 1902; Gamble, Man. Indian Timb., ed. 2, imp. 1, 524, 537--539, & 778. 1902; E. D. Merr., Philip. For. Bur. Bull. 1: 51. 1903; Prain, Beng. Pl., imp. 1, 1: 66, 823, & 828--829. 1903; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 433. 1904; Maiden, Commenc. Timb. N. S. Wales, ed. 2, 23. 1904; Maiden, For. Fl. N. S. Wales 1: 185, pl. 33. 1904; Post & Kuntze, Lexicon 688. 1904; T. Cook, Fl. Presid. Bombay, ed. 1, 3: 418 & 424--426. 1905; H. Hallier, Jahrb. Hamburg. Wiss. Anat. 22 (3): 31--46. 1905; MacMahon, Merch. Timb. Queensl. 53. 1905; E. D. Merr., Bull. Bur. Govt. Lab. Philip. 27: 68. 1905; Talbot, Syst. List Trees Shrubs Bomb., ed. 2, 269. 1905; F. N. Williams, Bull. Herb. Boiss., ser. 2, 5: 431. 1905; Brandis, Indian Trees, imp. 1 & 2, 502 & 509. 1906; Dale, Phil. Trans. Roy. Soc. Lond. B. 198: 221--263. 1906; Maiden, For. Fl. N. S. Wales 2: 199. 1906; G. Maxwell, Journ. Roy. Asiat. Soc. Straits 45: 47. 1906; E. D. Merr., Philip. Journ. Sci. Bot. 1, Suppl. 1: 121. 1906; Brandis, Indian Trees, imp. 2a, 502 & 509. 1907; Holtermann, Einfl. Klimas pl. 7, fig. 40. 1907; Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: 260--261, pl. 21, fig. 16 & 18. 1907; Gamble in King & Gamble, Journ. Asiat. Soc. Bengal 74 (2 extra): 794 & 823--825. 1908; Foxworthy, Philip. Journ. Sci., ser. C, 4: 554 & 576. 1909; Hunter, Journ. Straits Br. Roy. Asiat. Soc. 53: 101--102. 1909; Ridl., Journ. Straits Br. Roy. Asiat. Soc. 53: 101. 1909; Talbot, For. Fl. Bomb., ed. 1, 2: 343 & 348--350. 1909; Haines, For. Fl. Chota Nagpur 476, 486--487, & 597. 1910; Maiden, For. Fl. N. S. Wales 4 (40): pl. [20] & [21]. 1910; Woodrow, Gard. Trop., imp. 1 & 2 [Gard. India, ed. 6, imp. 7 & 8] 441. 1910; Brandis, Indian Trees, imp. 3, 502 & 509. 1911; Craib, Kew Bull. Misc. Inf. 1911: 443. 1911; Duthie, Fl. Upper Gang. Plain, ed. 1, 2: 88,

215, 220--221, & 264. 1911; Gerth van Wijk, Dict. Plantnames, imp. 1, 1: 596. 1911; Guilfoyle, Austral. Pl. 187. 1911; Pulle in Lorentz, Nova Guinea, ser. 1, 8 (1): 402. 1911; Ridl., Journ. Roy. Asiatic Soc. Straits 59: 156. 1911; Wehmer, Pflanzenst. 1: 648. 1912; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl., ed. 1 [Pared. Man. Bot. 2:] 69 & 157. 1911; Talbot, For. Fl. Bomb. 2: 349. 1911; Craib, Contrib. Fl. Siam Dicot. 164. 1912; Dunn & Tutchner, Kew Bull. Misc. Inf. Addit. Ser. 10: 201 & 203. 1912; Koord., Exkursionsfl. 3: 132, 137, & 414. 1912; Lace, List Trees Shrubs Burma, ed. 1, 64, 82, 128, & 133. 1912; E. D. Merr., Fl. Manila, imp. 1, 397 & 405--406. 1912; R. S. Pearson, Comm. Guide For. Econ. Prod. India 52. 1912; C. B. Robinson, Philip. Journ. Sci. Bot. 7: 414 & 416. 1912; F. M. Bailey, Compreh. Cat. Queensl. Pl. 386. 1913; Prain, Ind. Kew. Suppl. 4, imp. 1, 98. 1913; Rodger, Indian For. Bull., ser. 2, 16: 1--10. 1913; Gibbs, Journ. Linn. Soc. Lond. Bot. 42: 123. 1914; Koord. & Valet., Atlas Baumart. Java pl. 278. 1914; Dop, Bull. Soc. Bot. France 61: 321--323. 1915; Gerth van Wijk, Dict. Plantnames, imp. 1, 2: 584, 1180, 1208, & 1610. 1916; W. W. Sm., Notes Roy. Bot. Gard. Edinb. 9: 107--108. 1916; W. H. Br., Merr., & Yates, Philip. Journ. Sci. Bot. 12: 240. 1917; K. Heyne, Nutt. Plant. Ned. Ind., ed. 1, 4: 107, 118--119, & xiv. 1917; Lévl., Cat. Pl. Yun-nan 277. 1917; Maiden, Some Princip. Comm. Trees N. S. Wales [N. S. Wales For. Handb.] 207. 1917; E. D. Merr., Interpret. Rumph. Herb. Amboin. 452, 454, 486, & 594. 1917; E. D. Merr., Philip. Journ. Sci. Bot. 7: 165 (1917) and 12: 385. 1917; Basu, Indian Med. Pl., imp. 1, 3: 3, pl. 738 & 739. 1918; Firminger, Man. Gard. India, ed. 6, 2: 385 & 389. 1918; H. Hallier, Meded. Rijks Herb. Leid. 37: 55--60. 1918; E. D. Merr., Sp. Blanc. 333--334. 1918; Parker, For. Fl. Punjab, ed. 1, 395 & 398. 1918; Trelease, Bot. Centralbl. 138: 123. 1918; Wiesner, Rohst. 2: 464. 1918; A. Chev, Cat. Pl. Jard. Bot. Saigon 36. 1919; Dawkins, Indian For. 45: [505]--519, pl. 27 & 28. 1919; Farwell, Druggists Circ. 63: 50. 1919; Koman, Rep. Invest. Indig. Drugs 2: 50. 1919; H. J. Lam, Verbenac. Malay. Arch. 5, 214--228, & 365--366. 1919; Bose, Man. Indian Bot. 252 & 256, fig. 219. 1920; Cubitt, Rep. For. Admin. Fed. Malay St. 1920: 4. 1920; Smythies, Indian For. Rec. 7 (8): pl. 13. 1920; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 3 & 64--71. 1921; Brandis, Indian Trees, imp. 4, 502 & 509. 1921; Hubert, Verb. Util. Mat. Med. 1921; E. D. Merr., Bibliog. Enum. Born. Pl. 515. 1921; E. D. Merr., Philip. Journ. Sci. Bot. 19: 377. 1921; S. Moore, Journ. Linn. Soc. Lond. Bot. 45: 375--376. 1921; Prain, Ind. Kew. Suppl. 5, imp. 1, 115. 1921; Troup, Silvicult. Indian Trees 2: 697, 769--776, & 779, fig. 294--297. 1921; Gamble, Man. Indian Timb., ed. 2, imp. 2, 524, 537--539, & 778. 1922; Haines, Bot. Bihar Orissa, ed. 1, 4: 704, 715, & 717--720. 1922; Parkinson, For. Fl. Andam. Isls., imp. 1, 218 & 219. 1922; Rodger in Lace, List Trees Shrubs Burma, ed. 2, 131. 1922; Fedde, Justs Bot Jahresber. 45 (1): 525. 1923; Fedde & Schust., Justs Bot. Jahresber. 44: 254 (1922) and 45 (1): 90 & 148. 1923; E. D. Merr., Enum. Philip. Flow. Pl. 3: 399 & 400. 1923; Ridl., Fl. Malay Penins. 2: 611 & 622--623. 1923; Speyer, Bull. Ent. Res. 14: 11--23. 1923; Chung, Mem. Sci. Soc. China 1 (1): 227. 1924; Colthurst, Familiar Flow. Trees India 120--122. 1924; Gamble, Fl. Presid. Madras 2 (6): 1086 & 1097--1098. 1924; Haines,

Bot. Bihar Orissa, ed. 1, 6: 1296. 1924; Kaneh., Indian Woods 17. 1924; H. J. Lam in Diels, Engl. Bot. Jahrb. 59: 28. 1924; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 93 & 94. 1924; Parker, For. Fl. Punjab, ed. 2, 395, 398, & 580. 1924; L. H. Bailey, Stand. Cyclop. Hort., imp. 1, 2: 1352--1353. 1925; Boddington, Mem. Asia Soc. Beng. 10: 1, 3, 4, 6, 13--15, 38, 61, 75, 76, 90, 96--97, 105, 113, & 117. 1925; Chaudhuri, Indian For. 51: 57--60. 1925; Lane-Poole, Rep. For. Resources Terr. Papua N. Guin. 136. 1925; S. Moore, Journ. Bot. Lond. 63: Suppl. 81. 1925; Van der Merwe & Kent, Journ. Dept. Agric. Union S. Afr. 10: 29--42. 1925; Wangerin, Justs Bot. Jahresber. 53 (2): 644 & 645. 1925; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; Janssonius, Mikrogr. Holz. Java 754, 757--759, 761, 763, 764, 766, & 803--810, fig. 294. 1926; Lecomte, Gov. Gén. Indoch. Publ. Agenc. Econ. 13: 199. 1926; Thakar, Fl. Cutch 223. 1926; Wangerin, Justs Bot. Jahresber. 46 (1): 717. 1926; Boddington, Mem. Asia Soc. Beng. 10: 136, 152, 191, 193, 197, 220, 244, 252, 276, 282--284, 287--290, 294--296, & 300--302. 1927; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 245. 1927; K. Heyne, Nutt. Plant. Ned. Ind., ed. 2, 1: 24 (1927), ed. 2, 2: 1320--1321 (1927), and ed. 2, 3: 1646. 1927; E. D. Merr., Lingn. Sci. Journ. 5: 158. 1927; Osmaston, For. Fl. Kumaon 405 & 408--409. 1927; C. T. White & Francis, Proc. Roy. Soc. Queensl. 38: 257--258, fig. 18 (1927) and 39: 257, fig. 18. 1928; Bois, Pl. Aliment. 2: 440. 1928; Domin, Bibl. Bot. 22 (89): 1114. 1928; Francis, Proc. Linn. Soc. N. S. Wales 53: 474--484, fig. 1--9, & pl. 29--31. 1928; Sasaki, List Pl. Formos. 352 & 430. 1928; Wangerin, Justs Bot. Jahresber. 49 (1): 522. 1928; Bakh., Journ. Arnold Arb. 10: 68/69 & 71--72, pl. 16 & 17. 1929; Bakh. in White, Journ. Arnold Arb. 10: 264. 1929; J. M. Cowan, Rec. Bot. Surv. India 12: 29--34, 47, & 48. 1929; Fedde, Justs Bot. Jahresber. 46 (2): 607. 1929; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 322 & 327. 1929; Francis, Austral. Rainfor. Trees, ed. 1, 332--336, fig. 222--224. 1929; A. W. Hill, Ind. Kew. Suppl. 7: 104. 1929; Pflueger, Rev. Internat. Bot. Appliq. Agric. Trop. 9: 726--730 & 794--798. 1929; Allsop, Indian For. 56: 203--211. 1930; L. H. Bailey, Stand. Cyclop. Hort., imp. 2, 2: 1352--1353. 1930; L. H. & E. Z. Bailey, Hortus, ed. 1, 279. 1930; Burkill & Haniff, Gard. Bull. Straits Settl. 6: 233, 384, & 407. 1930; Rao, Agric. Journ. India 25: 17--25. 1930; W. W. Sm., Notes Roy. Bot. Gard. Edinb. 17: 148 & 212. 1930; Stapf, Ind. Lond. 3: 299. 1930; Wangerin, Justs Bot. Jahresber. 50 (1): 237 & 269. 1930; Normand, Rev. Internat. Bot. Appliq. Agric. Trop. 11: 168--174, pl. 3. 1931; Alston in Trimen, Handb. Fl. Ceyl. 6: Suppl. 232. 1931; Rodger in Lace, List Trees Shrubs Burma, ed. 3, 202. 1931; Kudo, Iconogr. Trop. Pl. Taiwan 2: pl. 16. 1931; Stapf, Ind. Lond. 6: 479 & 554. 1931; Wehmer, Pflanzenst. 2: 1024. 1931; G. F. Weber, Phytopath. 21: 1129--1140. 1931; Ali, Journ. Bomb. Nat. Hist. Soc. 35: 597. 1932; Chopra, Rep. Indig. Drugs Enquiry 34. 1931; Fedde, Justs Bot. Jahresber. 49 (2): 431 (1932) and 50 (1): 688. 1932; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Krishna & Ramaswami, Indian For. Bull., ser. 2, 79: 17. 1932; Pearson & Br., Commerc. Timb. India 2: 799 & 802. 1932; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 1, 7, & 115--122, pl. 23. 1932; L. H. Bailey, Stand. Cyclop. Hort., imp. 3, 2: 1352--1353. 1933; Ben-

thall, Trees Calcut., imp. 1, 352--354. 1933; Dop, Rev. Internat. Appliq. Agric. Trop. 13: 893--897. 1933; A. W. Hill, Ind. Kew. Suppl. 8: 102. 1933; Kanehira, Fl. Micrones. 341, 342, & 457. 1933; Charlton, Proc. 4th Silvicult. Conf. Dehra Dun 78--87. 1934; Crevost & Pételot, Bull. Econ. Indo-Chine 37: 1294--1295. 1934; J. C. M. Gardn., Indian For. Rec. 20 Ent.: 1--42. 1934; Hand.-Mazz., Ann. Hort. Gothenb. 9: [67]. 1934; Hochr., Candollea 5: 192. 1934; Naidu, Commerc. Timb. India 73. 1934; Pearson & Br., Commerc. Timb. India 2: 799. 1934; H. E. Thomas, Journ. Agric. Res. 48: 187--218. 1934; Wagle, Agric. Livest. India 4: 176--188. 1934; L. H. Bailey, List Florists Handl. Verb. [mss.]. 1935; L. H. Bailey, Stand. Cyclop. Hort., imp. 4, 2: 1352--1353. 1935; L. H. & E. Z. Bailey, Hortus, ed. 2, 279. 1935; Bakh., Journ. Arnold Arb. 16: 72--73. 1935; Dads-well & Eckersley, Austral. Counc. Sci. Indust. Res. Bull. 90: 70, fig. 55. 1935; Dop in Lecomte, Fl. Gén. Indo-chine 4: 776, 841--849, & 865, fig. 88. 1935; Hu, Bull. Chinese Bot. Soc. 1 (2): 95. 1935; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1932 & 1934--1935, pl. 738 & 739. 1935; Mathur, Indian For. Rec., ser. 2, 1 (2): 35--70. 1935; E. D. Merr., Trans. Am. Phil. Soc., ser. 2, 24 (2): [Comm. Lour.] 11, 274, 335, 336, & 426. 1935; Trevor, Emp. For. Rev. 14: 25--26. 1935; Beer & Lam, Blumea 2: 226. 1936; Sherples, Diseases Pests Rubb. Tree. 1936; Wangerin, Justs Bot. Jahresber. 56 (1): 669. 1936; Bell & Scott in Taylor & Francis, Fauna Brit. India Moths 5. 1937; Caresche, Trav. Inst. Rech. Agron. Indo-chine 1935/6: 195--212. 1937; Docters van Leeuwen, Blumea 2: 262. 1937; Fletcher, Kew Bull. Misc. Inf. 1937: 75. 1937; Alston, Kandy Fl. 63 & 64, fig. 345. 1938; Birch & Lyons, Journ. Proc. Roy. Soc. N. S. Wales 71: 391--405. 1938; W. A. Campbell, Bull. Torrey Bot. Club 65: 31--69. 1938; Fletcher, Kew Bull. Misc. Inf. 1938: 203--205, 401, 404, 406, 409, & 422--424. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 125. 1938; E. D. Merr., Journ. Arnold Arb. 19: 356. 1938; Wangerin, Justs Bot. Jahresber. 58 (1): 845. 1938; Fedde, Justs Bot. Jahresber. 58 (2): 550. 1939; Fedde & Schust., Justs Bot. Jahresber. 59 (2): 26. 1939; Garthwaite, Indian For. Rec., ser. 2, Ent. 5: 237--277. 1939; Kanjilal, Das, Kanjilal, & De, Fl. Assam, imp. 1, 3: 458, 459, 466--467, & 549. 1939; Savastopulo, Journ. Bomb. Nat. Hist. Soc. 40: 257--263. 1939; A. V. Thomas, Mal. For. 8: 84--85. 1939; Chun, Sunyats. 4: 268. 1940; Fedde & Schust., Justs Bot. Jahresber. 59 (2): 546. 1940; Mold., Phytologia 1: 418--419. 1940; Mold., Prelim. List Comm. Names 12. 1940; Mold., Suppl. List Comm. Vern. Names 2--6, 8--13, 16--22, & 24. 1940; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 332. 1941; Beeson, Ecol. Control For. Insects India. 1941; Biswas, Indian For. Rec. 3: 42. 1941; F. G. Browne, Mal. For. Rec. 22. 1941; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 185. 1941; Durant, Mal. For. 10: 89--92. 1941; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Harradence & Lyons, Chem. Abstr. 35: 460. 1941; E. D. Merr., Brittonia 4: 171--172. 1941; Mold., Suppl. List Inv. Names 3. 1941; Wangerin & Krause, Justs Bot. Jahresber. 60 (1): 704. 1941; Worsdell, Ind. Lond. Suppl. 1: 441. 1941; Bor, Indian For. Rec. 3: 152--195. 1942; Mold., Alph. List Inv. Names 12, 25, & 39. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 26, 29, 53--69, 73, & 93.

1942; Lemée, Dict. Descrip. Syn. Gen. Pl. Phan. 8b: 656. 1943; H. B. R. Parham, Fiji Nat. Pl. 68. 1943; Aylin-Erdtman & Erdtman, Chem. Abstr. 38: 5821. 1944; Limaye, Indian For. Rec., ser. 2, Util. 3 (5): 16. 1944; Menninger, Descrip. Cat. Flow. Trees 16. 1944; Trotter, Common Comm. Timb. India 109. 1944; Mold., Phytologia 2: 103--104. 1945; Savage, Cat. Linn. Herb. Lond. 107, 217, & 223. 1945; Benthall, Trees Calcut., imp. 2, 352--354. 1946; Blume, Cat. Gewass., imp. 2, 83. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 76, 666, 844, 1039--1040, & 1458 (1946) and imp. 2, 2: 622, 1213, 1214, & 1285. 1946; Menninger, 1947 Cat. Flow. Trop. Trees 19. 1946; E. D. Merr., Chron. Bot. 10: 263--264. 1946; Razi, Journ. Mysore Univ. 7 (4): 64. 1946; Chowhury, Nature 160: 609. 1947; Falcão, Guia Visitant. Jard. Bot. Rio Jan. 42. 1947; Gamble, Jt. Publ. Imp. Agric. Bur. 10: 117. 1947; Hill & Salisb., Ind. Kew. Suppl. 10: 100. 1947; Mold., Alph. List Inv. Names Suppl. 1: 8, 10, 11, & 16. 1947; H. N. & A. L. Mold., Pl. Life 2: 18, 20--24, 34, 49, 55, 59, 61, 68, 69, 78, & 81. 1948; Neal, In Gard. Haw., ed. 1, imp. 1, 635. 1948; Van Rensselaer, Trees Santa Barbara, ed. 2, 168, 169, & 191. 1948; Aggarwal & Soni, Journ. Sci. Indust. Res. (India) 8B: 49--51. 1949; Aggarwal & Soni, Chem. Abstr. 43: 5611--5612. 1949; Den Berger, Determinat. Houts. Mal. Fam. 73. 1949; Dordi, Indian Text. Journ. 59: 43 & 708. 1949; Hosokawa, Journ. Jap. Bot. 24: 44. 1949; Karanchandani, Indian For. 75: 505--511. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 46, 54, 117, 123--125, 127--130, 132, 135--139, 141, 143--151, 153, 160, & 186. 1949; Neal, In Gard. Haw., ed. 1, imp. 2, 635. 1949; Sri Gulabkunwarbi, Charak Samhita. 1949; Van Steenis, Bull. Bot. Gard. Buitenz., ser. 3, 18: 224. 1949; R. O. Williams, Useful Orn. Pl. Zanzib. 69, 95, 276, & 277. 1949; Guillaum., Bull. Mus. Hist. Nat. Paris, ser. 2, 22: 118. 1950; Jex-Blake, Gard. East. Afr., ed. 3, 130. 1950; Menninger, Winter 1950 Seed List. 1950; Metcalfe & Chalk, Anat. Dicot. 2: 1035, 1037, 1040, & 1041. 1950; Razi, Ecology 31: 285. 1950; C. T. White, Journ. Arnold Arb. 31: 113. 1950; Kalshoven, Plagen Cultuurgew. Indones. 1950-1951; Albert, Inst. Franc. Afr. Noir. Mem. 15: 1--174. 1951; Francis, Austral. Rain-for. Trees, ed. 2, 366--369, fig. 230--232. 1951; Mold., Phytologia 3: 417--418. 1951; Corner, Wayside Trees, ed. 2, 696, 702, & 703, fig. 257. 1952; Dastur, Indian For. 78: 275 & 365. 1952; Dastur, Med. Pl. India 126--127. 1952; Dastur, Useful Pl. India Pakist., ed. 6, 117--118. 1952; Geissman & Hinreiner, Bot. Rev. 18: 91. 1952; Guillaum., Bull. Mus. Nat. Hist. Nat. Paris, ser. 2, 23: 539--540. 1952; Janssonius, Key Javan Woods 53--54 & 213, fig. 294. 1952; Joshi & Magar, Journ. Sci. Indust. Res. (India) 11B: 26. 1952; Mold., Phytologia 4: 54--55. 1952; Paelt, Candollea 13: 248. 1952; V. S. Rao, Journ. Indian Bot. Soc. 31: [297], 308, 309, 312, & 313, fig. 50--54. 1952; Bagchee, Indian For. 79: 17--24. 1953; Bor, Man. Indian Bot. 302. 1953; Dale, Descrip. List Introd. Trees Uganda 43--44 & 72. 1953; Goossens, Suid-Afrik. Blompl. 188. 1953; Kedare & Tendelkar, Journ. Sci. Indust. Res. (India) 12B: 125 & 217. 1953; Menninger, 1953 Cat. Flow. Trop. Trees 40. 1953; Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178. 1953; Pételot, Pl. Med. Cambod. Laos Viet. 2 [Arch. Recherch. Agron. Past. Viet. 18]: 252--253. 1953; Pichon,

Taxon 2: 111. 1953; Purushotham & al., Indian For. 79: 43 & 49. 1953; Roig, Dicc. Bot. Nom. Vulg. Cub. 73, 74, & 550. 1953; Santapau, Pl. Saurashtra 31. 1953; Setten, Mal. For. 15: 165--169. 1953; Travancore Univ., Pharmacog. Ayurvedic Drugs, ser. 1, 2: 65. 1953; Anon., Biol. Abstr. 25: 4060 (1954) and 28: 3239. 1954; Bagshree, Indian For. Rec., ser. 2, Mycol. 1 (8): 99--184. 1954; Birch, Hughes, & Sm., Austral. Journ. Chem. 7: 83. 1954; Doanay, For. Inst. Oxford Spec. Subj. 1954; Fritz, Biol. Abstr. 28: 440. 1954; Mathur & Singh, For. Bull. Dehra Dun, ser. 2, Ent. 171: pts. 1--10. 1954-1961; Mold., Journ. Calif. Hort. Soc. 15: 86. 1954; Pételot, Pl. Méd. Cambod. Laos Viet. 4: 10, 20, 26, 28, 36, 38, 48, 59, 63, 64, 119, 151, 156, 224, 239, & 247. 1954; Phillips, For. Dept. Nigeria Inf. Bull. 14: 1. 1954; Santapau, Indian For. 80 (7): 387. 1954; Sarlin, Cent. Techn. For. Trop. Publ. 6: [270]--271, 285, 293, & 295, pl. 131. 1954; Seth, Princip. Grassl. Types. 1954; Vuillaume, Rév. Pathol. Vég. Entom. Agric. Franc. 33 (3): 122--198. 1954; Anon., Biol. Abstr. 27: 3765. 1955; Barnard, Emp. For. Rev. 34: 68--77. 1955; Mold., Phytologia 5: 226. 1955; R. S. Rao, Biol. Abstr. 29: 1223. 1955; Santapau, Journ. Gujarat Research Soc. 17: 39. 1955; Santapau & Raizada, Indian For. Rec. 4 (6): 157. 1955; A. C. Sm., Journ. Arnold Arb. 36: 287. 1955; Angely, Cat. Estat. Gen. Bot. Phan. 17: 4. 1956; Bakh. & Van Steenis, Taxon 5: 81. 1956; Barnard, Biol. Abstr. 30: 1111. 1956; Chopra, Nayar, & Chopra, Gloss. Indian Med. Pl. 126. 1956; Mold., Biol. Abstr. 30: 3551. 1956; Parker, For. Fl. Punjab, ed. 3, 395, 398, & 580. Saint John, Pacif. Sci. 10: 101. 1956; Sastri, Wealth India 4: 154--156, fig. 71 & 72. 1956; Anon., Biol. Abstr. 29: 3291 & 3628. 1957; Santapau, Fl. Purandhar 103--104 & 153. 1957; Van Steenis, Fl. Males, Bull. 11: 453 & xxxiv. 1957; Anon., Biol. Abstr. 30: 3983 & 4395. 1958; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14357. 1958; R. N. & I. C. Chopra, Handa, & Kapur, Indig. Drugs India, ed. 2, 509, 600, 607, 608, 610, 675, & 804. 1958; Chowdhury & Ghosh, Indian Woods 1: xxx, xlii, & 150. 1958; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 1, 2: 497 & 504--506. 1958; Kalshoven, Ent. Ber. Amst. 18: 147--160. 1958; Karrer, Konstit. Vork. Org. Pflanzenst. 464. 1958; Mensbruge, Proc. 2nd Inter-Afr. For. Conf. Pointe-Noire 2: 460--463. 1958; Mold., Phytologia 6: 324--327. 1958; Prain, Ind. Kew. Suppl. 4, imp. 2, 98. 1958; Sriburi, Vanasarn 16 (2): 69--72. 1958; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Anon., Kew Bull. Gen. Ind. 134. 1959; Cuf., Bull. Jard. Bot. Brux. 29: Suppl. 597. 1959; Dastur, Med. Pl. India Pakist. 126. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 185. 1959; Kribs, Comm. For. Woods, ed. 2, 160, fig. 330. 1959; LePelley, Agric. Insects 1-307. 1959; Mold., Biol. Abstr. 33: 1215. 1959; Mold., Résumé 55, 61, 75, 142, 144, 157--159, 163, 165--167, 170, 174, 176, 178, 180, 184, 186--193, 195--197, 199, 201--205, 207, 209, 218, 234, 276, 277, 285, 296--298, 302, 306, 318--320, 337, 339, 341, 354, 385, 386, 391, 419, 423, 427, & 456. 1959; Mold., Résumé Suppl. 1: 12 & 13. 1959; Newsam & Rao, Journ. Rubb. Res. Inst. Malaya 15: 209--215. 1959; Parameswaran Nayar, Bull. Bot. Surv. India 1: 124, 1959; Sebastine, Bull. Bot. Surv. India 1: 95. 1959; G. Taylor, Ind. Kew. Suppl. 12: 63. 1959; Uphof, Dict. Econ. Pl., ed. 1, 171. 1959; Willan, Nyasal. Fmr. For. 5 (1): 15--17. 1959; Worth-

ington, Ceyl. Trees 345. 1959; Angely, Liv. Gen. Bot. Bras. 35 & 46. 1960; Burkill, Dict. Econ. Prod. Malay Penins. 1: 953. 1960; Chowdhury & Ghosh, Indian Woods 2: 190. 1960; Duthie, Fl. Upper Gang. Plain, ed. 2, 88, 215, 220--221, & 264. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 76, 666, 844, 1039--1040, & 1458 (1960) and imp. 3, 2: 622, 1213, 1214, 1285, & 1975. 1960; L., Gen. Pl., ed. 5, imp. 2 [Cramer & Swann, Hist. Nat. Class. 3:] 274, [510], & 681. 1960; Menninger, 1960 Price List Flow. Trees [4]. 1960; Mold., Resume Suppl. 2: 7. 1960; Nath, Bot. Surv. South. Shan States 305. 1960; Ogbe, For. Inst. Oxford Spec. Com. 1960; Petroff & Doat, Cent. Techn. For. Trop. Publ. 19: 71--88. 1960; Prain, Ind. Kew. Suppl. 5, imp. 2, 115. 1960; Puri, Indian For. Ecol. 1: 40, 43, 173, 183, 189, 215, 228, 260, & 284 (1960) and 2: 406, 625, & 670. 1960; Riney & Child, Proc. 1st Fed. Sci. Cong. Salisb. 291--299. 1960; Van Royen, Nova Guinea, ser. 2, 10: 240. 1960; Anon., World Paper Trade Rev. 156: 1946. 1961; Boyle, Phytopath. 51: 117--119. 1961; Cave, Ind. Pl. Chromos. Numb. 2: 136. 1961; W. E. Cooper, Phytopath. 51: 113--116. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; Gupta & Marlange, Trav. Sect. Sci. Inst. Frang. Pond. 3 (1): 79.. 1961; Guha & Saxena, Res. Ind. 6 (8): 280. 1961; Haines, Bot. Bihar Orissa, ed. 2, 2: 738 & 753--755. 1961; Hansford, Sydowia Ann. Myc., ser. 2, Beih. 2: 694--695. 1961; W. V. Harris, Termites. 1961; Huntley & Ko in Lace, List Trees Shrubs Burma, ed. 4, 202. 1961; Irvine, Woody Pl. Ghana 756. 1961; Mold., Phytologia 8: 14. 1961; Mathur & Singh, Indian For. Rec. Ent. 10 (6): 1117--1118. 1961; Rangaswami & Venkata Rao, Proc. Indian Acad. Sci. 54: 51. 1961; Runner, Rep. Groff Coll. 362. 1961; Satmoko, Malay. Nat. Journ. Spec. Issue 120. 1961; Satmoko in Wyatt-Smith & Wycherley, Nat. Conserv. West. Malaysia 210. 1961; G. H. Watkins, Phytopath. 51: 110--113. 1961; E. West, Phytopath. 51: 108--109. 1961; Willaman & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 237. 1961; Beadle, Evans, & Carolin, Handb. Vasc. Pl. Sydney Dist. 414 & 415. 1962; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Veg. Map Ser. 1: 20, 28, 31, 32, & 41. 1962; Gerth van Wijk, Dict. Plantnames, imp. 2, 1: 596 (1962) and imp. 2, 2: 584, 1180, 1208, & 1610. 1962; Gledhill, Check List Flow. Trees Sierra Leone 30. 1962; Hocking, Excerpt. Bot. A.5: 44 & 45. 1962; Liu, Illustr. Nat. Introd. Pl. Taiwan 2: 1222, pl. 1030. 1962; S. & G. Manguenot, Rev. Cytol. Biol. Vég. 25: 446. 1962; Menninger, Flow. Trees World 283--284, 298, 316, 319, & 320. 1962; Mold., Biol. Abstr. 37: 1062. 1962; Mold., Résumé Suppl. 3: 17, 19, 21--25, 28, & 32 (1962) and 4: 7. 1962; Nair & Rehman, Bull. Nat. Bot. Gard. Lucknow 76: 2, 12, 13, 16--18, & 23, pl. 2, fig. 10, text-fig. 22. 1962; Raman & Kesavan, Nucleus 5: 123--126. 1962; Schedl, Revist. Ent. Moçamb. 5: 597--1352. 1962; B. Singh, Bull. Nat. Bot. Gard. Lucknow 69: 57. 1962; Sobti & Singh, Proc. Indian Acad. Sci. B.54: 143. 1962; Streets, Exot. For. Trees Brit. Commonw. 398--401. 1962; F. White, For. Fl. North. Rhodes. 365 & 368. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 433. 1963; Deb, Bull. Bot. Surv. India 5: 51--53. 1963; Eidt, FAO Publ. 1775: 1--68. 1963; Huber, Hepper, & Meikle in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432. 1963; Jain, Bull. Bot. Surv. India 5: 357--359. 1963;

Joseph, Bull. Bot. Surv. India 5: 293. 1963; Kalshoven, Ent. Ber. Amst. 23: 90--100. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 190, 192, 240, 252, 506, 511, 516, 525, 527, 530, 542, & 567. 1963; Maheshwari, Fl. Delhi 276 & 282--283. 1963; B. A. Mitchell, Mal. For. 26: 259--286. 1963; Mold., Dansk Bot. Arkiv 23: 90--91. 1963; Mold., Résumé Suppl. 7: 7. 1963; Prain, Beng. Pl., imp. 2, 1: 66 (1963) and imp. 2, 2: 614 & 618--619. 1963; Raman & Kesavan, Sci. Cult. 29: 413--414. 1963; Ramamurthy, Bull. Bot. Surv. India 5: 261 & 264. 1963; Rao, Aggarwal, & Mukherjee, Bull. Bot. Surv. India 5: 315. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 128. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 359, 369, 375, 376, 379, & 383, pl. 11, fig. 39 & 40. 1963; Sweeney, Bull. Dept. Agric. Nyasal. Prot. 21. 1963; Anon., Sympos. Internat. Dang. Dis. Insects. 1964; Anon., Fmr. For. 6 (3): 13--22. 1964; Bakh. & Van Steenis, Taxon 5: 31. 1964; A. Banerjee in Lahiri, West Beng. For. 48 & 54. 1964; W. Banerjee in Lahiri, West Beng. For. 91. 1964; Cave, Ind. Pl. Chromos. Numb. 2: 330. 1964; Chittenden, Coursey, & D. G. & J. O. Rotibi, Tappi 47 (12): 186A--192A (1964) and 57 (12). 1964; Chowdhury in Lahiri, West Beng. For. 99 & 130. 1964; Crossley & Ogunle, Res. Rep. Inst. Indust. Res. Nigeria 28: 1--4. 1964; Das in Lahiri, West Beng. For. 253. 1964; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Veg. Map Ser. 2: 15. 1964; Ghosh in Lahiri, West Beng. For. 114, 195, & 197. 1964; Jain, Proc. Nat. Inst. Sci. India 30: 68. 1964; Lee, Mal. For. 27: 370--374. 1964; Lord, Shrubs Trees Austral. Gard., ed. 2, 22--23. 1964; Mathur, Indian Journ. Ent. 1964: 437--455. 1964; Menninger, 1964 Seed List [2]. 1964; Mold., Résumé Suppl. 8: 3 (1964) and 11: 6. 1964; J. Muller in Cranwell, Ancient Pacif. Floras 39. 1964; Narayana Aiyar & Kolammal, Phramacog. Ayur. Drugs. 1964; Nevill, Dept. Agric. Tech. Serv. Pretoria Tech. Commun. 12: 173--175. 1964; Oberholzer, Dept. Agric. Tech. Serv. Pretoria Tech. Commun. 12: 169--172. 1964; J. W. Parham, Pl. Fiji Isls., ed. 1, 214, fig. 77. 1964; Peh, For. Res. Inst. Kepong Malaya Res. Paper 44: 1--21. 1964; Rao & Sastry, Bull. Bot. Surv. India 6: 160, 164, & 281. 1964; Ray in Lahiri, West Beng. For. 88. 1964; Santapau, Excerpt. Bot. A.7: 16. 1964; Srivastava, Indian Journ. Ent. 1964: 419--433, 1964; Thwaites & Hook. f., Enum. Pl. Ceyl., imp. 2, 244. 1964; Vyas, Journ. Indian Bot. Soc. 43: 326 & 331. 1964; Anon., Fed. Min. Inf. Lagos For. Prod. Res. Rep. L/2: 1--10 (1965) and L/5. 1965; Anon., Rep. *Gmelina* Fed. Min. Inf. Lagos FPRL/2. 1965; Backer & Bakh., Fl. Java 2: 606--607. 1965; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 168. 1965; Bose, Handb. Shrubs 9, 10, 52, 53, 108, & 121. 1965; Brunck, Bois Forêts Trop. 103: 17--25. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 694. 1965; Collado, Bur. For. Philip. Res. Notes 70. 1965; Datta, Handb. Syst. Bot. 182, 183, 339, 375, & 419. 1965; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Map Ser. 2: 21 & 31. 1965; Gaussen, Viart, Legris, & Labroue, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 5: 30. 1965; Maheshwari & Singh, Dict. Econ. Pl. India 77 & 128. 1965; Marlange & Meher-Homji, Journ. Indian Bot. Soc. 44: 175. 1965; Mold., Résumé Suppl. 12: 8 & 9. 1965; Mukerjee, Bull. Bot. Surv. India 7: 135. 1965; Nair, Asia Monog. India 1 (5): [Pollen Gr. W. Himal. Pl.] 35. 1965; Neal, In

Gard. Hawaii, ed. 2, 720, 721, & 730. 1965; Nielsen, *Introd. Flow. Pl. W. Afr.* 161. 1965; Roberts, *Prelim. Checklist Pests Dis. Plantat. Trees Nigeria* 30. 1965; Sen & Naskar, *Bull. Bot. Surv. India* 7: 46. 1965; M. R. Sm., *Cocoa Res. Inst. Tech. Bull.* 9: 1--68. 1965; Smitinand, *Govt. Sarawak Sympos. Ecol. Res. Humid Trop. Veg.* 45. 1965; Swift, *Nature* 207: 436--437. 1965; Van Steenis & Jacobs, *Fl. Males. Bull.* 20: 1329 & 1341. 1965; Vyas, *Journ. Indian Bot. Soc.* 44: 55. 1965; R. M. C. Williams, *Proc. XII Internat. Cong. Ent. Lond.* 675--676. 1965; Airy Shaw in Willis, *Dict. Flow. Pl.*, ed. 7, 309 & 484. 1966; Anon., *Fast Grow. Trop. Trees I Commonw. For. Inst. Mimeo. Ref. TT/5/1.* 1966; Ansell, *The Puku* 4: 1--16. 1966; Burkill, *Dict. Econ. Prod. Malay Penins.* 1: 1105--1107. 1966; J. L. Ellis, *Bull. Bot. Surv. India* 8: 337. 1966; Esan, *Study Variat. Struct. Feat. Prop. Gmelina [thesis]*. 1966; Esan, *Notes Prep. Visit Lamb.* 1966; Forsythe, *Check List Agric. Insects Ghana.* 1966; Freezailay Yeom & Sandras., *Mal. For.* 1966: 140--151. 1966; Gaussem & al., *Trav. Sect. Scient. Techn. Inst. Franc. Pond. Hors* 7: 24, 25, 28, 42, & 99 (1966) and 8: 35. 1966; Hall & Gooding, *Fls. Isls. Sun* 11, 41, 47, 117, 133, & 135, pl. 30. 1966; Jain & De, *Bull. Bot. Surv. India* 8: 247. 1966; L. J. King, *Weeds World* 58. 1966; Leggate, *Tech. Note* 1: 66. 1966; Majumdar, *Bull. Bot. Soc. Beng.* 20: 102. 1966; Mold., *Résumé Suppl.* 13: 6. 1966; Naithani, *Bull. Bot. Surv. India* 8: 259. 1966; Ramaswami, *Study Flow. Pl. Bangalore [thesis]* xxiii, xxix, 1015, 1031--1034, & 1412. 1966; Rao & Rabha, *Bull. Bot. Surv. India* 8: 296 & 301. 1966; Sandrasegaran, *Mal. For.* 29: 97--101, fig. 3. 1966; Sebastine & Henry, *Bull. Bot. Surv. India* 8: 304 & 309. 1966; Sebastine & Ramamurthy, *Bull. Bot. Surv. India* 8: 180. 1966; Subramanyam & Henry, *Bull. Bot. Surv. India* 8: 208 & 212. 1966; G. Taylor, *Ind. Kew. Suppl.* 13: 61. 1966; Venkatesan, *Indian For.* 92: 29. 1966; Whitmore, *Guide For. Brit. Solom. Isls.* 115, 116, 135, 148, & 184. 1966; Yeom & Sandrasegaran, *Mal. For.* 29: 140--153. 1966; Anon., *Ind. Bibliog. Bot. Trop.* 4 (1): 60. 1967; Blombley, *Guide Nat. Austral. Pl.* 191. 1967; Berhault, *Fl. Sénégal*, ed. 2, 122 & 126. 1967; T. Cooke, *Pl. Presid. Bombay*, ed. 2, imp. 2, 2: 497 & 504--506. 1967; Dandy, *Ind. Gen. Vasc. Pl. [Reg. Veg. 51:]* 43, 41, 121, & 122. 1967; Ellis, Swaminathan, & Chandrabose, *Bull. Bot. Surv. India* 9: 11. 1967; J. E. D. Fox, *Commonw. For. Rev.* 46: 138--144. 1967; Ful-ling, *Ind. Bot. Record. Bot. Review* 213. 1967; Gaussen, Legris, & Viart, *Indian Counc. Agr. Res. Veg. Map Ser.* 4: 16. 1967; R. K. Gupta, *Season. Fl. Indian Sum. Resorts Moos.* 67, 81, & 241. 1967; Joseph & Vajravelu, *Bull. Bot. Surv. India* 9: 26. 1967; Kammathy, Rao, & Rao, *Bull. Bot. Surv. India* 9: 207, 209, & 224. 1967; Maheshwari, *Fl. Delhi* 282. 1967; Mold., *Résumé Suppl.* 15: 8--10, 15, & 20. 1967; Ornduff, *Reg. Veg.* 50: 86 & 121. 1967; Panigr. & Saran., *Bull. Bot. Surv. India* 9: 251. 1967; Ramaswamy, *Bull. Bot. Soc. Beng.* 21: 89 & 96. 1967; Sandrasegaran, *Biol. Abstr.* 48: 2312. 1967; Santapau, *Bull. Bot. Surv. India* 8: 38. 1967; Sebastine & Ellis, *Bull. Bot. Surv. India* 9: 197. 1967; Srivastava, *Quart. Journ. Crude Drug Res.* 7: 1053. 1967; Tingle, *Check List Hong Kong Pl.* 38. 1967; Vajravelu & Rathakrishnan, *Bull. Bot. Surv. India* 9: 43. 1967; Van Steenis & Bakh., *Engl. Bot. Jahrb.* 86: 394. 1967; Van Steenis-Kruseman, *Fl.*

- Males. Bull. 4: lvi. 1967; D. & E. Venkata Rao & Viswanadham, Curr. Sci. (India) 36: 71--72. 1967; D. & E. Venkata Rao & Viswanadham, Hort. Abstr. 37: 57. 1967; Vyas, Journ. Bombay Nat. Hist. Soc. 64: 219. 1967; Whitmore, Gard. Bull. Singapore 22: 1 & [17]--21. 1967; Yeom & Sandrasegaren, Biol. Abstr. 48: 5531. 1967; Anon., Biol. Abstr. 49 (7): S.71. 1968; Badhwar & Fernandez, Edible Wild Pl. Himal. 285. 1968; F. G. Browne, Pests Dis. For. Plantat. Trees 15, 29, 36, 63, 77, 80, 103, 125, 168, 192, 193, 238, 239, 255, 261, 262, 290, 291, 311, 316, 332, 361, 362, 373, 376, 395, 402, 413, 415, 435, 482, 534, 541, 548, 549, 557, 576, 589, 605, 634, 647, 666, 672, 688, 689, 697, 698, 703, 715, 719, 728, 735, 736, 756, 818, 923, 938, 965, 982, 988, & 1069. 1968; Carrick & al., Chem. Pharm. Bull. Tokyo 16: 2436--2441. 1968; Cathary, Caract. Pollin. Esp. Mangr. [Rep. Stage D.E.A. Biol. Veg. Montpel.]. 1968; Das, Pakist. Journ. For. 18: 315. 1968; Deb. IndiaN For. 94: 755. 1968; Deb, Sengupta, & Malick, Bull. Bot. Soc. Beng. 22: 174 & 210. 1968; J. L. Ellis, Bull. Bot. Surv. India 10: 157. 1968; Gaur & Gupta, Journ. Reg. Indian Med. 3: 43--48. 1968; Gunawardena, Gen. Sp. Pl. Zeyl. 147. 1968; Inamdar, Bull. Bot. Surv. India 10: 130. 1968; Khan, Fat Med. Groth Trees 4: 63 & 64. 1968; Kribs, Comm. For. Woods, ed. 3, 160, fig. 330. 1968; A. F. A. Lamb, Fast Grow. Timb. Trees Lowl. Trop. 1--31. 1968; Meijer, Bot. Bull. Herb. For. Sect. Sabah 10: 223 (1968) and 11: 112. 1968; E. D. Merr., Fl. Manila, imp. 2, 397 & 405--406. 1968; Mohrhard, Dict. Cat. Nat. Agric. Lib. 27: 402. 1968; Mold., Résumé Suppl. 16: 7, 9, & 22. 1968; G. C. Morrison, Pacif. Sci. 22: 184--193. 1968; Mukherjee & Ghosh, Bull. Bot. Soc. Beng. 22: 94 & 95. 1968; Panigrahi & Saran, Bull. Bot. Surv. India 10: 55 & 58. 1968; Patel, Fl. Melghat 263--264. 1968; Uphof, Dict. Econ. Pl., ed. 2, 71, 246, 327, 337, 428, 513, & 541. 1968; Vajravelu, Joseph, & Chandrasekaran, Bull. Bot. Surv. India 10: 68 & 78. 1968; Yeom & Sandrasegaran, Biol. Abstr. 49: 5531. 1968; Anon., Biol. Abstr. 50 (10): B.A.S.I.C. S.81 (1969) and 50 (12): B.A.S.I.C. S.84. 1969; Anon. in Joshi, Indian For. 94: 152. 1969; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Ind. 1968: 54. 1969; Battacharjee & Das, Econ. Bot. 23: 275. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 715. 1969; Caudhuri, Bull. Bot. Soc. Beng. 23: 112, 114, 115, 119, 120, & 123. 1969; Chan & Teo, Chem. Pharm. Bull. Tokyo 17: 1284--1286. 1969; Cherian & Pataskar, Bull. Bot. Surv. India 11: 392. 1969; R. N. & I. C. Chopra & Varma, Suppl. Gloss. Indian Med. Pl. 33. 1969; Corner & Watanabe, Illustr. Guide Trop. Pl. 760--761. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Ind. 6: 264. 1969; J. E. D. Fox, Biol. Abstr. 50: 5299. 1969; Hughes & Esan, Trop. Sci. 11: 23--37. 1969; Joshi, Indian For. 95: 152 & 153. 1969; Kapoor, Singh, Kapoor, & Srivastava, Lloydia 32: 303. 1969; Keng, Ord. Fam. Malay. Seed Pl. 278 & 280. 1969; Kundu & Gupta, Bull. Bot. Surv. India 11: 333. 1969; Longman in Woolhouse, Dormancy Surviv. 473. 1969; Misra, Bull. Bot. Surv. India 11: 327. 1969; Mold., Biol. Abstr. 50: 6338 & 7999. 1969; Mold., Phytologia 18: 71. 1969; Mold., Résumé Suppl. 18: 7, 8, & 12. 1969; Palit, Indian For. 95: 226. 1969; Preston in Syngae, Suppl. Dict. Gard. 903. 1969; [Qureshi] in Joshi, Indian For. 95: 152. 1969; Rau, Bull. Bot. Surv. India 10, Suppl. 2: 62. 1969;

Roberts, Commonw. For. Inst. Off. Paper 44: 7--12, 21, 22, 25, 33, 34, 41, 43, 44, 47, 50, 67, 68, 72, 73, 75, 127, 135, 183, & 184. 1969; Santapau & Shah, Journ. Bomb. Nat. Hist. Soc. 66: 438. 1969; Sathe, Bull. Bot. Surv. India 11: 171 & 181. 1969; Sawyer & Chermis-sir., Nat. Hist. Bull. Siam Soc. 23: 126. 1969; Schroeder, Biol. Abstr. 50: 10809. 1969; G. L. Shah, Indian For. 95: 270 & 275. 1969; Shah & Deshpande, Bull. Bot. Surv. India 11: 283. 1969; Singh, Bull. Bot. Surv. India 11: 15. 1969; Venkatareddi, Bull. Bot. Surv. India 11: 258. 1969; Agarwal, Wood-yield. Pl. India 23. 1970; Ahman, Pakist. Journ. For. 20: 220. 1970; Anon., Biol. Abstr. B.A.S.I.C. 51 (13): S.87 (1970) and 51 (17): S.89. 1970; Babbar & al., Indian Journ. Exp. Biol. 8: 304--312. 1970; El-Gazzar & Wats., New Phytol. 69: 457, 469, 471--473, 483, & 485. 1970; Farnsworth, Pharmacog. Titles 5 (3): iii & item 2397 (1970), 5 (4): vi & item 3987 & 4119 (1970), and 5 (11): viii & item 14140. 1970; Gaussen, Legris, Blas-co, Meher-Homji, & Troy, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 10: 56, 57, 83, & 128. 1970; Hocking, Excerpt. Bot. A.15: 422. 1970; Jain & Tarafder, Econ. Bot. 24: 254. 1970; Joshi & Singh, Zeit. Naturforsch. B.25: 693--694. 1970; LAMB, Bol. Inst. For. Latino-Am. 33/34: 22--51. 1970; Lamb & Cooling in Frankel & Bennett, Genet. Resources 376--378. 1970; Matthew, Bull. Bot. Surv. India 12: 88. 1970; Menninger, Flow. Vines 406, dust-jacket & fig. 194. 1970; Mold., Biol. Abstr. 51: 9630. 1970; Mold., Phytologia 19: 439. 1970; Mold. in Menninger, Flow. Vines 334, pl. 194. 1970; Ode-yemi, Suom. Kemisliis. Tiedonant. [Finn. Kem. Medd.] 41: 57--70. 1970; Puri, Quart. Journ. Crude Drug Res. 10: 1560. 1970; D. V. & E. V. Rao, Indian Journ. Pharm. 32 (5): 140--141. 1970; Rouleau, Guide Ind. Kew. 82 & 352. 1970; "J. G. S.", Biol. Abstr. 51 (13): 7097. 1970; Saxena, Bull. Bot. Surv. India 12: 56. 1970; Shah & Patel, Bull. Bot. Surv. India 12: 25. 1970; Vidal & Lemoine, Journ. Agr. Trop. Appl. 17: 27. 1970; Angely, Fl. Anal. Fitogeog. S. Paulo, ed. 1, 4: 826 & viii. 1971; Anon., Biol. Abstr. 52 (7): B.A.S.I.C. S.97 (1971) and 52 (16): B.A.S.I.C. S.106. 1971; Anon., Indian For. 97: 158 & 160. 1971; Balan Menon, Malay. For. Rec. 27: 102--103. 1971; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 200. 1971; Blas-co, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 10: 47, 149, & 152. 1971; Brandis, Indian Trees, imp. 5, 502 & 509. 1971; Chippendale, Proc. Linn. Soc. N. S. Wales 96: 256. 1971; Danganan, Biol. Abstr. 52: 8956. 1971; Farnsworth, Lynn Ind. 7: 230. 1971; Farnsworth, Pharmacog. Titles 5, Cumul. Gen. Ind. (1971), 6 (1): viii & item 1370 (1971), 6 (2): iv & item 2721 (1971), and 6 (8): ix & item 14208. 1971; Fonseka & Vinasithamby, Prov. List Local Names Flow. Pl. Ceyl. 16, 21, 27, 48, 63, & 93. 1971; J. E. D. Fox, Trop. Ecol. 12: 2. 1971; Gerth van Wijk, Dict. Plantnames, imp. 3, 1: 596 (1971) and imp. 3, 2: 584, 1180, 1208, & 1610. 1971; Govindachari, Parthas., Desai, & Mohamed, Journ. Indian Chem. 9: 1027. 1971; Hartwell, Lloydia 23: 386 & 432. 1971; Inamdar & Patel, Indian For. 97: 328. 1971; Joshi & al., Journ. Indian Chem. Soc. 48: 1175--1176. 1971; M. A. Martin, Introd. Ethnobot. Camb. 142. 1971; Menon, Malay. For. Rec. 27: 26, 40, 42, & 102--103, fig. 36, 37, 80, & 84. 1971; Mold., Excerpt. Bot. A.18: 445. 1971; Mold., Fifth Summ. 1: 100, 110, 129,

- 214, 230, 237, 264, 265, 268, 270, 271, 276, 280, 281, 283, 289, 292, 294, 296, 301, 305, 317, 320, 324, 325, 330, 332--334, 336--341, 343, 346, 350, 362, 363, 391, 423, 441, 472, & 475 (1971) and 2: 491, 523, 524, 526, 533, 542, 569, 572, 606, 609, 611, 614, 615, 622, 643, 716, 720--722, 731, 739, 742, 778, 791, 879, 880, 970, & 972. 1971; Mold., *Phytologia* 20: 494 & 507 (1971) and 21: 220 & 507. 1971; J. F. Morton, *Ecot. Pl.* 123. 1971; Mukhopadhyay, *Pollen Morph. Verb.* [thesis]. 1971; Patel, *For. Fl. Gujarat* 228--230. 1971; Puri, *Quart. Journ. Crude Drug Res.* 11: [1746]. 1971; Rao, Venkata, & Rao, *Biol. Abstr.* 52: 3659. 1971; Roxb., *Fl. Indica*, ed. 2, imp. 3, 485--487. 1971; Vartak & Chitnis, *Indian For.* 97: 154 & 160. 1971; Versteegh, Meded. Landbouwhoges. Wagen. 71-19: 15, 37, & 38. 1971; Wittstein, *Etymolog.-bot. Handwörterb.*, ed. 2, imp. 2, 394. 1971; C. D. Adams, *Flow. Pl. Jamaic.* 627 & 819. 1972; Anjaneyulu & al., *Tetrahed. Lett.* 22: 2179--2182. 1972; Anon., *Biol. Abstr.* 53 (4): B.A.S.I.C. 53 (4): S.109 & S.145 (1972) and 53 (8): S.110. 1972; Anon., *Commonw. Myc. Inst. Ind. Fungi* 3: 823. 1972; Beadle, Evans, Carolin, & Tindale, *Fl. Sydney Reg.*, ed. 2, 506 & 508. 1972; Clifford & Ludlow, *Keys Fam. Gen. Queensl. Pl.* 124 & 202. 1972; Cuf., *Bull. Jard. Bot. Nat. Belg.* 42: Suppl. [Enum. Pl. Aethiop.] 1638. 1972; Dymock, Warden, & Hooper, *Pharmacog. Indica*, imp. 2 [Hamdard 15:] 72--73 & 348--349. 1972; Encke & Buchheim in Zander, *Handwörterb. Pflanzennam.*, ed. 10, 74 & 269. 1972; Farnsworth, *Pharmacog. Titles* 7 (2): vi & item 3283 & 3965 (1972), 7 (3): v & 177 (1972), 7 (4): xi & 222 (1972), 7 (10): vii (1972), 7 (11) v & 739 (1972), 7 (15): v & 223 (1972), and 8 (9): vi & 582. 1972; Fong, Trojankova, Trojanek, & Farnsworth, *Lloydia* 35: 147. 1972; Foreman, *Div. Bot. Dept. For. N. Guin. Bot. Bull.* 5: 63, 126, & [127]. 1972; Gamble, *Man. Indian Timb.*, ed. 2, imp. 3, 524, 537--539, & 778. 1972; Govindachari, Parthas., & Desai, *Indian Journ. Chem.* 10: 1120--1122. 1972; Govindachari, Parthas., & Desai, *Biol. Abstr.* 53: 2214. 1972; Kochar, Dixit, & Somaya, *Mosq. News* 32: 114--115. 1972; Korr, *Biol. Abstr.* 53: 4494. 1972; Letouzey, *Man. Bot. For. Afr. Trop.* 2 (B): 362. 1972; McIntype, *Natl. Geogr.* 142: 485. 1972; Mitra, *Journ. Bomb. Nat. Hist. Soc.* 69: 18 & 23. 1972; Mold., *Phytologia* 23: 319, 417, 422--426, 432, 505, & 507. 1972; A. L. Mold., *Phytologia* 23: 319. 1972; T. B. Muir, *Muelleria* 2: 167. 1972; J. W. Parham, *Pl. Fiji Isls.*, ed. 2, 299--300, fig. 90. 1972; Parkinson, *For. Fl. Andam. Isls.*, imp. 2, 218 & 219. 1972; Rouleau, *Taxon Ind.* 1: 163 & 382. 1972; Stainton, *For. Nepal* 77. 1972; R. R. Stewart, *Annot. Cat. in Nasir & Ali, Fl. West Pakist.* 606. 1972; Thanikaimoni, *Trav. Sect. Scient. Techn. Inst. Franç. Pond.* 12 (1): 105. 1972; Airy Shaw in Willis, *Dict. Flow. Pl.*, ed. 8, 316, 317, & 496. 1973; Anon., *Biol. Abstr.* 55 (11): B.A.S.I.C. S.106 (1973) and 56 (4): B.A.S.I.C. S.109. 1973; Anon., *Bull. Gov. For. Exp. Sta. Meguro Tokyo* 254: 60, 61, 64, & 66, fig. 2 & 3XIG. 1973; "J. J. B.", *Biol. Abstr.* 55: 6071. 1973; Chaturved, *Indian For. Rec.* 12 (12): 1--7. 1973; Desch, *Timber*, ed. 5, imp. 2, 391. 1973; Farnsworth, *Pharmacog. Titles* 6, *Cum. Gen. Ind.* [56] (1973) and 8(11): vi & 857. 1973; Govindachari, Parthas., & Desai, *Biol. Abstr.* 56: 2236. 1973; Hartley, Dunstone, Fitzg., Johns, & Lamberton, *Lloydia* 36: 293. 1973;

Hegnauer, Chemotax. Pfl. 6 [Chem. 21]: 660, 662--664, 671, & 676--679. 1973; Mold., Phytologia 25: 232--234, 240, & 507 (1973) and 26: 365, 366, 368, & 504. 1973; Onwelluzo, Fed. Dept. For. Res. Ibadan Res. Paper 20: 1--6. 1973; Rao, Stud. Flow. Pl. Mysore Dist. [thesis] 2: 750--751. 1973; Rao & Razi, Journ. Mysore Univ. B.26: 71, 102, & 194--196. 1973; Thanikaimoni, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 12 (2): 58. 1973; Wedge, Pl. Names, ed. 1, 18. 1973; Anon., Indian For. 100 (5): A.47. 1974; L. H. & E. Z. Bailey, Hortus Sec., imp. 18, 322 & 332. 1974; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 2, 715. 1974; W. B. Cooke, Biol. Abstr. 58: 233. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Farnsworth, Pharmacog. Titles 9 (1): xii (1974), 9 (3): x (1974), 9 (4): iv (1974), 9 (5): iv (1974), And 9 (8): iv & 643. 1974; Gibbs, Chemotax. Flow. Pl. 1: 676 (1974) and 3: 1752--1755, 1794, & 2136. 1974; Heslop-Harrison, Ind. Kew. Suppl. 15: 38 & 151. 1974; Howes, Dict. Useful Pl. 25, 108, & 255. 1974; Lasser, Braun, & Steyerl., Act. Bot. Venez. 9: 36. 1974; López-Palacios, Pittieria 6: 13--[18], maps 1 & 2. 1974; Mani, Ecol. Biogeogr. India [Illies, Monog. Biol. 23:] 185, 198, 209, 210, & 244. 1974; Mold., Phytologia 28: 443, 446, 448, 449, 458, & 509. 1974; A. L. Mold., Phytologia 29: 172. 1974; Napp-Zinn, Anat. Blatt. A (1): 232, 352, 383, 418--419, 1042, & 1343. 1974; Ramachandra, Row, & al., Chem. Commun. [12]: 476--477. 1974; Sterno & Roche, Ecol. Stud. 6: 262. 1974; Wedge, Pl. Names, ed. 2, 24. 1974; Basu, Indian Med. Pl., imp. 3, 3: pl. 738 & 739. 1975; Das, Indian For. 101: 556. 1975; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [53]. 1975; Jaeger & Mold., Phytologia 30: 387, 389, & 403. 1975; Jiménez, Anuar. Acad. Cienc. Rep. Dom. 1: 127. 1975; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: 1912 & 1931--1935. 1975; Kooiman, Act. Bot. Neerl. 24: 462. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 27--29. 1975; Mold., Phytologia 29: 508 (1975), 30: 508 (1975), 31: 390, 391, 398, & 406 (1975), and 32: 47. 1975; Molina R., Ceiba 19: 96. 1975; Ojo, Res. Paper (Savan. Ser.) Fed. Dept. For. Res. Nigeria 35: 551. 1975; Roth, Nov. Pl. Sp., imp. 2, 287--289. 1975; Roxb., Fl. Indica, ed. 1, imp. 2, 86. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Anon., Biol. Abstr. 61: ACl:619. 1976; Anon., For. Abstr. 37: 551 (1976) and 37: (10): 6. 1976; Anon., Courier-News [Plainfield, N. J.] November 1: C.1. 1976; L. H. & E. Z. Bailey, Hortus Third 515--516 & 1149. 1976; Follmann-Schrag, Excerpt. Bot. A.26: 508. 1976; Kunkel, Excerpt. Bot. A.26: 416. 1976; Mold., Phytologia 32: 509 (1976) and 34: 263, 265, 266, 269, 274, 275, & 504. 1976; Srivastava, Fl. Gorak. 252 & 255. 1976; Talbot, For. Fl. Bomb., ed. 2, 2: 343 & 348--350, fig. 451. 1976; Thanikaimoni, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 13: 104 & 328. 1976; Anjaneyulu, M. & K. Rao, Row, Pelter, & Ward, Biol. Abstr. 64: 459. 1977; Anjaneyulu, M. & K. Rao, Row, Pelter, & Ward, Tetrahed. Lett. 33: 133--144. 1977; Babu, Herb. Fl. Dehra Dun 15. 1977; Chin, Gard. Bull. Singapore 30: 195. 1977; Drake del Castillo, Illustr. Fl. Ins. Mar. Pacif., imp. 2, 260 & 432. 1977; Gaussen, Legris, Meher-Homji, Fontale, Pascal, Chandrah., Delacourt, & Troy, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 14: 46,

47, 52, 59, 61, & 84. 1977; González Meza, Milit. Advis. Group (MAG) Direc. Gen. For. San José 1--27. 1977; Goodland & Irwin in Prance & Elias, Extinct. Forever, imp. 1, 220. 1977; P. Herm., Mus. Zeyl., imp. 3, 3, 9, 12, & 21. 1977; Jack, Malay. Misc., imp. 2, 1 (1): [Descrip. Malay. Pl.] 17--18 & opp. A. 1977; Jiménez & Liogier, Moscosoa 1 (2): 14. 1977; Joshi, Singh, & Pardasani, Pl. Med. 32: 71--75. 1977; Konishi, Bull. Gov. For. Exp. Sta. 297: 174 & 180. 1977; López-Palacios, Fl. Venez. Verb. 11, 12, 317--322, 649, & 652, fig. 76 & 77. 1977; McIntyre, Natl. Geogr. 152: 714 & 715. 1977; Meher-Homji, Feddes Repert. Spec. Nov. 88: 119. 1977; Mold., Phytologia 36: 38, 40, 43, & 505. 1977; Subramanian & Kalyani, Indian For. 103: 113 & 117. 1977; Goodland & Irwin in Prance & Elias, Extinct. Forever, imp. 2, 220. 1978; Joshi, Singh, & Pardasani, Biol. Abstr. 65: 1622. 1978; Kowal & Kassam, Agric. Ecol. Savan. 237. 1978; Lord, Trees Shrubs Austral. Gard., ed. 5, xx & 22--23. 1978; Meher-Homji, Fontanel, Pascal, Chandrasanan, & Delacourt, Trav. Sect. Scient. Techn. Inst. Franc. Pond. Hors 15: [Cart. Internat. Tap. Veg. Allahab.] 47 & 63. 1978; Muchovej, Albuquerque, & Ribeiro, Pl. Dis. Rep. 62: 717--719. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 44, 47, & 52. 1978; Odebiyi & Sofowore, Lloydia 41: 245. 1978; Sharma, Shetty, Vivekan., & Rathakr., Journ. Bomb. Nat. Hist. Soc. 75: 33. 1978; A. C. Sm., Allertonia 1: 414--415. 1978; Sprangers & Balasubram., Trop. Ecol. 19: 85, 86, & post 92. 1978; Akachuku & Burley, IAWA Bull. 1979: 94--99. 1979; Fosberg, Sachet, & Oliv., Micronesica 15: 235. 1979; LaBastille, Audubon 81 (6): 87. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24. 1979; Muchovej, Albuquerque, & Ribeiro, Biol. Abstr. 67: 1754. 1979; F. Muell., Descrip. Notes Papuan Pl., imp. 2, 5: 91 & 113 (1979) and 8: 46. 1979; Villegas & Coto R., Bibliog. For. Amer. Trop. 114. 1979; Fosberg, Otobed, Oliv., Powell, & Canfield, Vasc. Pl. Palau 38. 1980; Hsiao, Fl. Taiwan 6: 12. 1980; Jayasuriya, Stud. Fl. Ecol. Ritig. 197. 1980; Liu & Yu, Act. Bot. Yunnan 2: 457. 1980; McIntyre, Natl. Geogr. 157: 695, 696, 698, 699, 701, 704, & 705. 1980; Mold., Phytologia 46: 490, 491, & 507. 1980; Mold., Phytol. Mem. 2: 93, 102, 122, 205, 220, 227, 237, 253, 254, 256--258, 262, 263, 267, 268, 270, 273--275, 279, 281, 283, 286, 289, 290, 293, 296, 298, 307, 308, 311, 315, 320, 322--324, 327--331, 333, 337, 341, 354, 375, 394, 405, 408, 409, 412, 422, 423, 432--435, 445, 549, 550, & 627. 1980; Ojeniyi & Agbede, Turrialba 30: 268--271 & 290--293. 1980; Raman & Das, Indian For. 106: 622. 1980; Richards in Ayensu, Jungles 123. 1980; Roxb., Hort. Beng., imp. 2, 46 & [95]. 1980; Sydow in Broberg, Linnaeus 215. 1980; Vogel, Seedl. Dicot. 92. 1980; Anon., Read. Digest 118 (708): 27. 1981; Arseculeratne, Gunatikaka, & Panabokka, Journ. Ethnopharm. 4: 166. 1982; Brennan, Ind. Kew. Suppl. 16: 130. 1981; Deb, Fl. Tripura 1: 16. 1981; Francis, Austral. Rain-for. Trees, ed. 4, 366--369 & 372, fig. 230--232. 1981; Hillebr., Fl. Haw. Isl., imp. 2, 340. 1981; Mold., Phytologia 49: 380 & 508. 1981; J. Muller, Bot. Rev. 47: 98. 1981; Munz & Slauson, Ind. Illust. Living Things Outside N. Am. 255 & 359. 1981; Rouleau, Repert. Nom. Gen. Ind. Kew. 111 & 480. 1981; Sharma, Shetty, Vivekan., & Rathakr., Journ. Bomb. Nat. Hist. Soc. 75: 33. 1981; Varma,

Fl. Bhagalpur Dist. 304 & 306--307. 1981; Webb & Tracey in Groves, Austral. Veg. 80, fig. 4.6 (29). 1981; Whitmore in Hora, Oxford Encycl. Trees World 263 & 265. 1981; Baas, New Persp. Wood Anat. 154 & 158. 1982; Baumgardt, How Identify Flow. Pl. Fam. 264. 1982; Beishya & Rao, Florist. Stud. Meghalaya 1: 8. 1982; Evans, Plant. For. Trop. 191, 316, & 317. 1982; Fosberg, Otobed, Sachet, Oliv., Powell, & Canfield, Vasc. Pl. Palau 38. 1982; Kanjilal, Das, Kanjilal, & De, Fl. Assam, imp. 2, 458, 459, 466--467, & 549. 1982; Liogier & Martorell, Fl. Puerto Rico 152 & 318. 1982; López-Palacios, Revist. Fac. Farm. Univ. Andes 22: 18 & 51. 1982; Nayar & Debnath, Journ. Econ. Tax. Bot. 3: 835. 1982; Mold., Phytologia 50: 251--253, 255, 261, 265, 370, & 507 (1982), 51: 391 & 494 (1982), 52: 23 (1982), and 52: 505. 1983; Badillo, Schnee, & Rojas, Ernstia 14: [Clav. Fam. Pl. Sup. Venez., ed. 6] 232. 1983; Mold., Phytologia 54: 238--240 & 242--244. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 198, 327, & 388--401. 1983; Raj, Rev. Palaeobot. Palyn. 39: 356--357, 360, 372, 377, 382, 384, 389--391, 395, & 410--412, pl. 13, fig. 2. 1983; Storey, Natl. Geogr. 163: 30 & [39]. 1983; Guha Bakshi, Fl. Murshidabad Dist. 252. 1984; Mold., Phytologia 54: 505 (1984) and 55: 42 & 234. 1984.

Deciduous or evergreen trees or shrubs, erect or subscandent (especially when young) or even prostrate, occasionally high-climbing, sometimes spinose, glabrous to more or less puberulent to villosulous or tomentose, the youngest shoots usually more or less tomentose or tomentulose, the spines (when present) morphologically aborted branchlets or twigs, axillary, divaricate, opposite, stiff; leaves decussate-opposite, simple, exstipulate, petiolate or sessile, thin-membranous to rather thickly coriaceous, mostly deciduous, mostly marginally entire, sometimes sinuate, dentate, or (on young shoots, seedlings, or turions) lobed, often with a few rather large sunken glands at or near the base beneath and which usually are more or less bullate above, sometimes densely lepidote beneath; inflorescence cymose, determinate, centrifugal, often paniculate, sometimes racemiform, axillary or (usually) terminal, mostly many-flowered, rarely 1--3-flowered, usually bracteate or bracteolate, sometimes conspicuously so; bracts usually small and linear, deciduous or caducous, rarely large, foliaceous, brightly colored, and persistent; true bracteoles usually absent; flowers usually large, often externally tomentose or tomentellous (at least when immature), solitary in the leaf-axils or borne in small, simple or branched, dense or lax, decussate-opposite, sessile or pedunculate, mostly 1--5-flowered cymules, these often combined into a terminal, erect, simple or branched panicle, or a nodding or pendent raceme; calyx gamosepalous, inferior, campanulate or obconic to conic, coriaceous, persistent, often somewhat irregular or oblique, sometimes even more or less bilabiate, often with 2--7 external glands on the anterior side or with numerous, scattered, small, black glandules, its rim shortly or shallowly 4- or 5-toothed, sinuate-lobed, or entire to truncate, rarely distinctly bilabiate with ovate apically acute divisions; corolla gamopetalous, zygomorphic, obliquely campanulate or infundibular, mostly yellow or orange-yellow to reddish, red, or

brownish, sometimes white or pinkish to violet, lilac, purple, or dark-blue, more or less bilabiate, often externally tomentose or tomentulose (especially when young), often rather compressed, the tube sometimes madder-purple, basally slender, apically greatly ampliate and dilated into the usually campanulate or trumpet-shaped limb, the limb oblique, spreading, often more or less bilabiate, 4- or 5-lobed or -fid, the upper lip convex or arched and usually entire or 2-lobulate, the lower lip usually 3-lobed or 3-fid, the 2 lateral lobes often rounded or the 2 posterior lobes connate, the middle or anterior lobe largest; stamens 4, distinctly didynamous, inserted in the corolla-tube usually at the base of the ampliate portion, included or subexserted, shorter than the corolla-lobes, the 2 longer filaments glanduliferous and decurved; anthers oblong, 2-celled, medifixed or attached at the basal incision, divaricate, the thecae opening by parallel longitudinal slits; pistil solitary, superior; style slender or filiform, apically decurved; stigma subulate or shortly and unequally bifid, the posterior branch usually shorter; ovary compound, bicarpellary, superior, 4-celled (or rarely by abortion 2-celled) during anthesis, each cell 1-ovulate; ovules attached laterally at or above the middle, pendulous; fruit a rather large, more or less succulent drupe, borne on a scarcely enlarged fruiting-calyx, ovoid-ellipsoid to obovoid, the exocarp usually yellow and juicy when mature, often nigrescent, the endocarp (pyrene or stone) hard and bony, undivided, 4-celled (or by abortion only 3- or 2-celled), each cell 1-seeded; seeds oblong, not membranous-winged, without endosperm, endozoic in dissemination, the 2 cotyledons thick; radicle inferior; chromosome number: $2n = 36, 38, \text{ or } 40$.

Type species: *Gmelina asiatica* L.

This is a genus of about 48 specific and subspecific taxa, native to tropical and subtropical Asia from Pakistan, Bhutan, Nepal, and India, through Sri Lanka, Burma, Thailand, Indochina, and Malaya, north to southern China, eastward through the Philippine and Palau Islands, Indonesia, Micronesia, and Melanesia to New Caledonia, Fiji, and Hawaii (introduced), and south to northern Australia; introduced in several African and South American countries. Several species are widely cultivated in tropical regions for timber, pulp, or ornament, and as specimen plants elsewhere.

Linnaeus (1743) originally described the genus as "*GMElina*: *Michelia* Amm. Act. petr. tom. 8. CAL. Perianthium monophyllum, minimum, obtusum. COR. monopetala, ringens, patula, limbo quadridido: Lacinia superiori ampliori, fornicata. Lacinia infima, later-alibusque obtusis, minoribus, patentibus. STAM. Filamenta duo, longitudine corollae. Antherae subrotundae. PIST. Germen subrotundum. Stylus longitudine staminum. Stigma.... PER. Bacca globosa, unilocularis. SEM. Nux ovata, levis, bilocularis." The Amman reference given by Linnaeus and copied verbatim by Schauer (1847) and other authors really is to Amman's paper entitled "Quinque nova plantarum genera" in the *Commentarii Academiae Scientiarum Imperialis Petropolitanae*, volume 8, for the year 1736. For this information I am indebted to Miss S. M. D. FitzGerald, Chief Librarian and Archivist at the Royal Botanic Gardens, Kew.

Historically, it is of interest to note that the genus was considered to contain about 8 species by Benthams (1876), Vidal (1883), Hooker (1885), Durand (1888), Briquet (1895), Trimen (1895), Cook (1908), Parker (1918), Benthall (1933), and Dalla Torre & Harms (1963); Preston (1969) says "8 to 10"; Corner (1952) recognized 12 species, P'ei (1932) 32 species, and Angely (1956) 45 species.

The genus, in the Linnean system, belongs in the *Didynamia Angiospermia*. Later it was placed in Jussieu's Natural Order *Personatae*. Reichenbach (1828) classified it in his *Labiatae*, Sect. *Verbeneae*.

Riley (1963) gives $2n = 40$ as the standard chromosome number for the genus. Common names for it are "gmelin", "gmelina", "gmeline", "gméline", "Heilpeeren", and "melina". It seems to have been named in honor of Johann Georg Gmelin (1709--1755), a German professor of botany, chemistry, and natural history at Leningrad, famed for his work on Siberian plants.

Gunawardena (1968), Preston (1969), and Woodrow (1910) assert that the generic name honors "J. Gottlieb Gmelin", described as a professor of botany at Leningrad from 1743 to 1774. In view of the date when Linnaeus described the genus (1743) it seems far more probable that it was intended to commemorate the older man. Parker (1924) ascribes the genus to "S. Gottlieb Gmelin" whom he describes as "a celebrated German naturalist and traveler of the 18th century" See No. 3, below, to whom all four of these authors are apparently referring].

Smith (1810) provides the following interesting details: he maintains that the name was given "in honour of John George Gmelin [in the usual British fashion of anglicizing foreign names!], a native of Tübingen [=Tübingen], professor of chemistry and natural history at Petersburg, who spent ten years in travelling through Siberia, at the expense of the Russian government, and whose *Flora Siberica*, in four vols. quarto, with plates, is a book of great reputation and merit. The first and second volumes were published in his lifetime; the third and fourth long after his death, which happened in 1755, at the age of 46. He took his arrangement from Van Royen. Haller says the plates are unworthy of the beautiful drawings, which he himself had seen. -- This genus also serves to commemorate four or five more botanists of the same family, especially Samuel Theophilus Gmelin, nephew of the former, and his successor in the professorship, who published a *Historia Fucorum*, with plates, in 1768, one of the most popular books on submarine botany, and who died in 1774, aged 31.--" The genus may, indeed, "commemorate" this nephew, but surely he was not the man Linnaeus intended to honor.

Smith gives us still more details about Johann Georg Gmelin -- He was "a physician and eminent botanist....born at Tübingen on the 12th of August, 1709. He was distinguished by his diligence and early attainments at school, and at the age of fourteen was deemed ready for entrance upon the academical studies of his native place. In 1727, he took the degree of doctor of physic, and went to Petersburg whither some of his teachers had been invited. Here he gained many favours from Blumentrost, the director of the academy, and was so highly esteemed, that, in 1729, he was elected one of the members

of the academy, and in 1731 was appointed professor of chemistry and natural history. In 1733, he was selected for the department of natural history, in a commission formed by the Russian government, for the purpose of exploring the boundaries of Siberia; and set out on the 19th of August, with G. F. Muller, and Louis de l'Isle de la Croyere, and a party of twenty-eight persons, consisting of draughtsmen, miners, hunters, land surveyors, and twelve soldiers, with a serjeant and drummer. In the month of February, 1743, Gmelin returned safe to Petersburg, after having employed nine years and a half in this long and dangerous journey, which proved highly interesting to the sciences, and he resumed the offices which he had before filled. In the year 1749, he entered upon a new professorship, to which he had been appointed, on the death of Bachmeister, while on a visit to Tübingen. He died of a fever in May, 1755, in the forty-sixth year of his age."

Wittstein (1852) lists several other members of the Gmelin family whom this genus is said to "commemorate": (1) Philip Friedrich Gmelin, brother of J. G., born in 1721 in Tübingen and professor of medicine, botany, and chemistry there, died in 1768, author of "Otia Botanica"; (2) Johann Friedrich Gmelin, son of P. F., born in 1748 in Tübingen, in 1771 became professor of natural history and botany there, in 1778 became professor of medicine in Göttingen, died there in 1804, published "Onomatologia Botanica Complete" and edited the 13th edition of Linnaeus' Systema Naturae; (3) Samuel Gottlieb Gmelin, nephew of J. G. and P. F., born in 1748 in Tübingen, professor of botany in Leningrad, travelled at government expense with Pallas, Guldensstedt, and Lapochin through Russia from 1763 to 1773, captured on the return trip by guerrillas and died in their hands in 1774 - he published, among other works, a "Historia Fucorum"; (4) Karl Christian Gmelin, born in Badenweiler, physician in Karlsruhe, professor and director of the botanical garden there, died there in 1837, published a "Flora Badensis, Alsatica et Confinium Regionum".

Ainslie (1826) avers that "Professor Gmelin, of Petersburg" "first scientifically described the type species, *G. asiatica*, but I have not yet been able to ascertain where this was published." It is most probable that Ainslie merely ASSUMED that Gmelin must have been connected with the description of the type species.

It is of passing interest to note that in botany there is another genus, *Caroli-Gmelina* Gaertn., Mey., & Scherb., named for still another member of this distinguished family. It is now regarded as a synonym of *Rorippa* Scop. in the *Brassicaceae*.

Hallier (1918) comments about the genus *Gmelina*: "Diese Gattung bekundet mehr wie irgend eine andere durch die Blattform (bei *Gm. arborea* Roxb., wie bei *Paulownia*, bei anderen Arten mehr wie bei *Wightia*), durch die endständigen Rispen der grösseren Arten, durch die Drüsen am Kelch, durch die Form der Blumenkrone und der gespreizten Staubbeutel, dass die Verbenaceen neben den Bignoniaceen aus *Paulownia* und *Wightia*-artigen Cheloneen entstanden sind. *Gm. philippinensis* Cham. hat auf der Unterseite des Blattes etwas entfernt vom Mittelnerven jederseits eine Reihe grösserer Drüsen (ausser kleinen zerstreuten Drüsenköpfchen), wie sie an gleicher

Stelle auch bei Simarubaceen.....Linaceen (Humirieen und *Arcistrocladus*), Malpighiaceen, Polygalaceen (*Diclidanthera* und *Xanthophyllum*).....Chrysobalanaceen (Chrysobalaneen, *Trigoniasium* und *Dichapetalum*), Marcgraviaceen (auch *Tetramerista*).....und Ebenaceen (*Diospyrus*- und *Maba*-arten).....vorkommen. Bei anderen Arten, wie z.B. *Gm. chinensis* Benth. und *Balansa* no. 3806 von Tonking, finden sich unterseits am Blattgrunde in der Nervenwinkeln eine ganze Anzahl solcher Drüsen, ebenso auch bei *Wightia gigantea* Wall. An gleichen Stelle, doch auch vereinzelt über die ganze Blattfläche zerstreut, hat *Paulownia imperialis* Sieb. et Zucc. Drüsen unter dem Haarkleid, doch sind es hier grosse Schildhaare, wie bei *Clerodendrum*-arten.....und bei Bignoniaceen.....Die am Kelch von *Gmelina*, vielen Bignoniaceen, *Aeschynanthus*-arten, Bombacaceen usw. vorkommenden Drüsen finden sich bei der Bignoniacee *Adenocalymma comosum*.....auch auf der Unterseite der Brakteen, ganz ebenso, wie bei der Chrysobalanacee *Trigoniasium* und vielen Malpighiaceen. Es scheint mir übrigens noch gar nicht ausgemacht zu sein, ob die Verbenaceen eine einheitliche Familie sind oder ob nicht vielmehr die Verbenen und einige andere Sippen abgetrennt werden müssen."

Junell (1934) discusses the gynoeceum morphology of *Gmelina* as follows: "Die Ausbauchungen von den mittleren Partien der Fruchtblätter verwachsen hier wie bei *Tectona* schon im obersten Teil des Fruchtknotens mit den ihrerseits verwachsenen Plazenten. An Längsschnitten.....wieht man einen Zipfel wie ein Dach über jede Samenanlage vorragen. Dieser Zipfel wird jedoch nicht von den Fruchtblatträndern gebildet. An Querschnitten von Fruchtknoten sieht man nämlich, dass dieser Zipfel innerhalb der Fruchtblattränder liegt... Es ist kein leitendes Gewebe ausgebildet. Dies kann möglicherweise darauf zurückgeführt werden, dass die untersuchten Fruchtknoten sehr jung waren. Obwohl die abgebildeten Querschnitte von dem Teil des Fruchtknotens stammen, der oberhalb der Sameanlagenbefestigungen liegt, sieht man in der Mitte der Querschnitte ein kräftiges Gefäßbündel. An der Längsschnitten von jungen Samenanlagen von *G. asiatica* habe ich gesehen, dass eine Tapetumschicht ausgebildet wird. Der Nuzellus ist im Verhältnis zur Samenanlage sehr unbedeutend und liegt tief in derselben versenkt."

The name, *Cumbulu*, is accredited to Adanson by Airy Shaw, but in Adanson's work (1763) it is plainly accredited to "H. Malab. 1: pl. 41" and therefore by inference to Rheede. As "*Cumbalu* Adans." and "*Cumbula* Steud." it is reduced to *Catalpa* by Jackson (1893) and even so by Pichon (1953). In Taxon (1956) Bakhuizen and Van Steenis point out that *Cumbulu*, as proposed by Adanson in his Fam. Pl. 2: 199 (1763) was based on two pre-linnean illustrations: (1) *Cumbulu* Rheede, Hort. Malab. 1: pl. 41 (1678) and *Tittius* Rumpf, Herb. Amboin. 2: pl. 20 (1741). The former depicts *Gmelina arborea* "J. Sm." [so credited also by Bakhuizen & Van Steenis, above] according to L. W. Dillwijn, Rev. Hort. Malab. 3 (1839). The second illustration, *Tittius*, is, according to Merrill (1917), a depiction of *Gmelina moluccana* (Blume) Backer, although the accompanying description applies to a species of *Clerodendrum*. Bakhuizen and Van Steenis assert that the *Cumbulu* of Adanson is actually in part *Gmelina* and

in part *Catalpa* in the *Bignoniaceae*. Dandy (1967), however, regards it as a straight synonym of *Gmelina* and in this disposition I concur. As Lourteig (1956) has pointed out: "the early occurrence of *Catalpa* either in India or in the Moluccas is a plant-geographical absurdity".

The *Ephielis* of Banks & Solander (1838), referred to in the synonymy (above), is a synonym of *Vitex* Tourn., while that of Schreber (1791) is synonymous with *Ratonia* P.DC. in the *Sapindaceae*.

Briquet (1895) divides the genus *Gmelina* into two Sections: (1) *Bracteatae* Briq. for *G. philippensis* Cham. and (2) *Microstromatae* Briq. for all the other species known to him.

Chowdhury (1964) tells us that in West Bengal the genus is associated in the wild with *Prenna*, *Acacia catechu*, and *Dalbergia sissoo* in the gradual ecologic succession on first settling quickly deposited sand or silt.

Preston (1969) asserts that under cultivation "The species need stove conditions and rich fibrous loam. They can be struck from cuttings of firm young shoots in sand in heat."

Van Steenis & Bakhuizen (1967) assert that "Gmelinas have always golden yellow flowers". Cook (1908) says that the corollas are either yellow or brownish-yellow. Actually, according to collectors, the corollas are sometimes in some species reddish, red, brownish, white, pinkish, violet, lilac, purple, or even dark-blue, as well as chocolate, pinkish-brown, reddish-yellow, dull yellow-brown, orange, or reddish-yellow, often externally reddish due to a reddish tomentum.

Hillebrand (1888) lists the genus as cultivated in Hawaii. Puri (1960) says that it occurs in the sal (*Shorea robusta*) tropical moist deciduous forests of Assam, associated there with *Vitex peduncularis* and *Clerodendrum*, and where it is a food plant for the insect, *Indarbela quadrinotata*, which also attacks many other kinds of trees, including *Callicarpa* and *Tectona* [cf. Benson, *The Ecology and Control of Forest Insects of India and the Neighbouring Countries*, 1941]. Benthall (1933) says that "Two or three thorny, climbing shrubs of this genus are sometimes grown in Bengal gardens".

Dymock (1884) asserts that the Pharmacopoeia of India (p. 164) is authority for the statement that "Several species belonging to this genus appear to be sometimes used as demulcents" in India.

Kanishi (1977) has reported "nail withdrawal resistance" of the wood of two unidentified species of *Gmelina*. An anonymous writer (1973) reports on an unidentified species of this genus whose trunks may produce logs 6.8 m. long, the top end 58--66 cm. in diameter, the butt end 64--74 cm. in diameter, and the sapwood 3--4 cm. wide. Van Royen (1960) reports his no. 4891 as representing an as yet unidentified species of *Gmelina*.

Gibbs (1974) reports that *Gmelina* may be an accumulator of aluminum, that tannins are absent, that gmelinol (a lignin) and a mucilage are present, and that saponins are reported absent or "probably" absent.

The Commonwealth Mycological Institute (1972) reports two fungi, *Helicomicina microphora* and *Phyllactinia suffulta* var. *gmeliniae*, as known to attack species of *Gmelina*.

It is perhaps worth noting here that the *Michelia* credited to Houston and to Adanson are now regarded as synonyms of *Pontederia* L. in the *Pontederiaceae*, while the *Michelia* of Kuntze and of Linnaeus (1735) are *Barringtonia* J. R. & G. Forst. in the *Barringtoniaceae*, the *Michelia* of Th. Durand is *Lophotocarpus* Th. Dur. in the *Alismaceae*, the *Michelia* of Linnaeus (1737) is a valid genus in the *Magnoliaceae*, and the *Michelia* of Linnaeus (1811) is *Rhododendron* in the *Ericaceae*.

It may also be worth noting here that Pfeiffer (1874) cites the Persoon (1806) reference to *Gmelina* [which he refers to as "Ench."] as "1807", but actually pages 1--272 of this work were issued in 1806. Similarly, he cites Roxburgh's "Corom. II" as "1798", but pages 29--40 and plates 151--175 were actually not published until April, 1802. He also cites vol. 3, page 41, plate 246, of the same Roxburgh work as "1819", but actually pages 25--48 and plates 226--250 of this volume were probably published in May of 1815 [Taylor (1959) and Srivastava (1976) make the identical error]. Pfeiffer cites Willdenow (1802) as "1800", but part 2 of volume 3 was actually published between November 1 and 10, 1802. He cites Miquel, Fl. Ind. Bat. 2: 865 as "1857", but pages 705--880 of this volume were not actually issued until April 8, 1858.

The index to Justs Botanische Jahresbericht, volume 49, claims that *Gmelina* is mentioned on page "322", but actually it is on page 522.

Stapf (1930) makes the same mistake, mentioned above, of dating Roxburgh's 1802 reference as "1798" and his 1815 reference as "1819". He also mis-dates Rumpf's 1741 reference as "1743" and Poiret's 1819 reference as "1797". The Linnaeus, Gen. Pl. (1754) citation is often given as "526" or "763", but actually occurs on page 274. The Schnitzlein (1856) reference is often cited as "1843-1870", the title-page date, and, similarly, the Endlicher (1838) reference is often given as "1836-1856".

Excluded species:

- Gmelina indica* Burm. ex H. J. Lam, Verbenac. Malay. Arch. 366 in syn. 1919 = *Flacourtia indica* (Burm. f.) Merr., *Flacourtiaceae*.
- Gmelina indica* Burm. f., Fl. Indica 132. 1768 = *Flacourtia indica* (Burm. f.) Merr., *Flacourtiaceae*.
- Gmelina javanica* Christm., Pflanzensyst. 2: 134. 1777 = *Flacourtia indica* (Burm. f.) Merr., *Flacourtiaceae*.
- Gmelina oleifera* Abel ex Mold., Phytologia 34: 274 in syn. 1976 -- not verbenaceous.
- Gmelina siamica* Mold., Phytologia 5: 226. 1955 = *Wightia speciosissima* (D. Don) Merr., *Scrophulariaceae*.
- Gmelina speciosissima* D. Don, Prodr. Fl. Nepal 104. 1825 = *Wightia speciosissima* (D. Don) Merr., *Scrophulariaceae*.
- Gmelina tacabushia* Buch.-Ham. ex Jacks. in Hook. f. & Jacks., Ind Kew., imp. 1, 1: 1040 in syn. 1893 = *Wightia speciosissima* (D. Don) Merr., *Scrophulariaceae*.
- Gmelina tacabushia* Hamilton ex D. Don, Prodr. Fl. Nepal 105. 1825 = *Wightia speciosissima* (D. Don) Merr., *Scrophulariaceae*.

Gmelina tacabuskia Hamilt. ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947 = *Wightia speciosissima* (D. Don) Merr., *Scrophulariaceae*.

Tittius litorea Rumpf, Herb. Amboin. 3: 39. 1743 = *Guettarda speciosa* L., *Rubiaceae*.

A very tentative artificial key to most of the accepted taxa:

1. Natives of Australia.
 2. Cymes reduced to dense, opposite, sessile clusters along the panicle-branches, bracteate at the base....*G. fasciculiflora*.
 - 2a. Cymes not as described above.
 3. Leaf-blades densely tomentose beneath.....*G. leichhardtii*.
 - 3a. Leaf-blades glabrous (except for the venation) beneath.....*G. dalrympleana*.
- 1a. Not exclusively native to Australia.
 4. Native exclusively to New Caledonia.
 5. Leaf-blades narrow-elliptic to ovate-lanceolate, to 13 cm. long and 7 cm. wide, basally cuneately acute or acuminate, minutely lanuginous-glandular to glabrescent beneath.....*G. lignum-vitreum*.
 - 5a. Leaf-blades ovate to suborbicular, to 17 cm. long and 14.5 cm. wide, basally obtuse or rounded, farinose beneath.....*G. neocaledonica*.
 - 4a. Not native to New Caledonia.
 6. Native exclusively to the Fiji Islands.....*G. vitiensis*.
 - 6a. Not native to the Fiji Islands.
 7. Flowers 1--3 in the axils of the leaves.
 8. Leaf-blades glabrous and shiny above, the lower surface glandulose but not pubescent (except for the larger veins); flowers solitary.....*G. uniflora*.
 - 8a. Leaf-blades pilose-hirtellous above, densely subvillous beneath; flowers 1--3.....*G. uniflora* var. *villosa*.
 - 7a. Flowers regularly arranged in terminal racemes, cymes, or panicles or terminating short axillary twigs.
 9. Racemes drooping or pendent, conspicuously bracteate with large, foliaceous, often highly colored bracts.
 10. Leaf-blades glabrous or subglabrous beneath or pilose only on the largest venation.....*G. philippensis*.
 - 10a. Leaf-blades conspicuously pilose over the entire lower surface of the lamina.....*G. philippensis* f. *transitoria*.
 - 9a. Inflorescence erect; bracts not as described above.
 11. Calyx distinctly lobed, the lobes to 11 mm. long.
 12. Ovary externally densely pubescent; leaf-blades 7--15 cm. long; inflorescence dense....*G. hainanensis*.
 - 12a. Ovary externally glabrous; leaf-blades not over 2.5 cm. long; inflorescence lax.....*G. delavayana*.
 - 11a. Calyx not distinctly long-lobed.
 13. Leaf-blades more or less densely pubescent beneath.
 14. Leaves large, the blades 10--25 cm. long and 4--18

- cm. wide; petioles 3--7 cm. long.
15. Leaf-blades apically usually acute; corolla 2.3--4.5 cm. long, the upper lip longer than the lower.
16. Pedicels 5--6 mm. long; corolla yellowish-violet.....
G. balansae.
- 16a. Pedicels 1.5--3 mm. long; corolla usually yellow or red.
17. Calyx regular or only slightly bilabiate; corolla usually yellow.
18. Leaf-margins entire.
19. Ovary externally glabrous.
20. Leaf-blades densely tomentose beneath..*G. arborea.*
- 20a. Leaf-blades gray-pubescent with simple hairs beneath.....*G. arborea* var. *canescens.*
- 19a. Ovary apically externally pubescent.
21. Leaf-blades broadly ovate to rounded or subcordate
G. racemosa.
- 21a. Leaf-blades elliptic-lanceolate.....*G. balansae.*
- 18a. Leaf-margins dentate on juvenile leaves.....
G. arborea f. *juv. dentata.*
- 17a. Calyx plainly bilabiate; corolla red....*G. annamensis*
- 15a. Leaf-blades apically obtuse or rounded; corolla 1.6--1.9 cm. long, the upper lip shorter than the lower.
22. Cymes sessile; fruit globose.
23. Inflorescence mostly simple.
24. Leaf-blades sparsely pubescent above.....*G. sessilis.*
- 24a. Leaf-blades glabrous and shiny above.....
G. sessilis var. *papuana.*
- 23a. Inflorescence conspicuously branched.....
G. sessilis f. *ramiflora.*
- 22a. Cymes stipitate; fruit oblong or subobovate.
25. Leaf-blades ovate or broadly ovate.....*G. moluccana.*
- 25a. Leaf-blades elliptic.....*G. moluccana* var. *elliptica.*
- 14a. Leaves smaller, the blades 3--9 cm. long, 2.5--5.5 cm. wide; petioles 5--10 mm. long.
26. Leaf-blades glabrous or only faintly pubescent above.
27. Leaf-blade margins entire.....*G. elliptica.*
- 27a. Leaf-blade margins plainly lobed...*G. elliptica* f. *lobata.*
- 26a. Leaf-blades densely tomentose above.....*G. tomentosa.*
- 13a. Leaf-blades glabrous beneath or pubescent only on the larger venation, rarely farinose.
28. Leaf-blades covered with small brown scales beneath.
29. Leaf-blades usually both apically and basally short-acuminate, to 11 cm. long and 6 cm. wide; calyx lepidote.
30. Leaf-blades mostly elliptic or narrow-elliptic; native to the Molucca & New Guinean islands.....
- 30a. Leaf-blades elongate-lanceolate; native to New Britain...
G. lepidota var. *lanceolata.*
- 29a. Leaf-blades usually both apically and basally rounded, to 15 cm. long (or more) and 10 cm. or more wide; calyx densely pubescent.....*G. smithii.*
- 28a. Leaf-blades not lepidote beneath.

31. Leaf-blades somewhat bluish-green and minutely farinose beneath.
G. chinensis.
- 31a. Leaf-blades not as described above.
32. Inflorescence terminating short axillary twigs, narrowly elongate-racemose, to 18 cm. long and 3 cm. wide, glabrous and nigrescent.....*G. misoolensis*.
- 32a. Inflorescence not as described above.
33. Leaf-blades 3--10.5 cm. long, 1.9--5 cm. wide; petioles 8--25 mm. long.
34. Leaf-blades basally long-attenuate.....*G. attenuata*.
- 34a. Leaf-blades basally acute, cuneate, or rounded.
35. Inflorescence a small, compact, terminal panicle.....
G. paniculata.
- 35a. Inflorescence a small terminal raceme of cymes.
36. Leaf-blade margins entire or 1-lobulate...*G. asiatica*.
- 36a. Leaf-blades conspicuously 3--7-lobed.....
G. asiatica f. *lobata*.
- 33a. Leaf-blades 8--40 cm. long, 4.5--35 cm. wide; petioles 2--7 cm. long.
37. Leaf-blades glaucescent beneath.....
G. arborea var. *glaucescens*.
- 37a. Leaf-blades not glaucescent beneath.
38. Leaf-blade margins coarsely 3--5-dentate with lobe-like teeth when immature, sinuate when adult....*G. sinuata*.
- 38a. Leaf-blade margins entire.
39. Calyx externally glabrous or subglabrous.
40. Leaf-blades basally rounded to cordate-truncate.
41. Leaf-blades basally rounded, with 2 large orchidaceous glands...*G. palawensis* var. *novoguineensis*.
- 41a. Leaf-blades basally cordate-truncate, not glanduliferous.....*G. dalrympleana*.
- 40a. Leaf-blades basally acute and decurrent.
42. Leaf-blades coriaceous or subcoriaceous.
43. Leaf-blades distinctly obovate, basally broadly attenuate-cuneate.*G. palawensis* var. *celebica*.
- 43a. Leaf-blades elliptic, basally acuminate.....
G. palawensis var. *dinagatensis*.
- 42a. Leaf-blades chartaceous.....*G. palawensis*.
- 39a. Calyx externally pilose or pubescent.
44. Inflorescence paniculate, lax; cymes long-stipitate.
45. Leaf-blades to 40 cm. long and 35 cm. wide; calyx externally densely ferruginous-villose.....
G. moluccana var. *glabrescens*.
- 45a. Leaf-blades to 19.5 cm. long and 11.5 cm. wide; calyx externally merely appressed-pubescent.
46. Leaf-blades ovate, marginally curvate, 8--14 cm. long, 4.5--9 cm. wide; corolla 1.4 cm. long; ovary externally apically stiff-pilose.....
G. ledermanni.
- 46a. Leaf-blades obovate-oblong, marginally straight, 14.5--19.5 cm. long, 8--11.5 cm. wide; corolla

2 cm. long; ovary externally glabrous.....

G. dalrympleana var. *schlechteri*

- 44a. Inflorescence racemiform or pseudospicate, very dense, at least the upper flowers in subsessile cymules.....*G. brassii*.

GMELENA ANNAMENSIS Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 893--897. 1933.

Bibliography: Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 893--897. 1933; Dop in Lecomte, Fl. Gén. Indo-chine 4: 842, 845, & 848, fig. 88 (2 & 3). 1935; A. W. Hill, Ind. Kew. Suppl. 9: 125. 1938; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 93 (1942) and ed. 2, 136 & 186. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14357. 1958; Mold., Résumé 176. 1959; Mold., Fifth Summ. 1: 301 (1971) and 2: 879. 1971; Mold., Phytol. Mem. 2: 293. 1980.

Illustrations: Dop in Lecomte, Fl. Gen. Indo-chine 4: 848, fig. 88 (2 & 3). 1935.

A tree, to 10 m. tall; branchlets at first pubescent, later glabrescent, with brown, striate, lenticellate bark; petioles 3--5 cm. long, glabrous, canaliculate above; leaf-blades broadly ovate or ovate-elliptic, rigidly chartaceous, 10--15 cm. long, 6--10 cm. wide, apically acute or shortly acuminate, marginally entire, basally truncate or acute, green, glabrous, and slightly rugose above, silvery-white and lightly pubescent beneath; midrib prominent beneath; secondaries 8, the 2 lowermost issuing from the leaf-base; veinlets subparallel; panicle terminal, 6--10 cm. long, puberulent; bracts foliaceous, elliptic-lanceolate, 3-veined, covered with very small black glandules; flowers 3.5 cm. long; calyx conic, 1.7 cm. long, externally puberulent and covered with numerous, very small, black glandules, the tube 1.1 cm. long, the limb plainly bilabiate, the upper lip 6 mm. long, 11 mm. wide, and 3-fid, the lower lip 5 mm. long, 9 mm. wide, and bifid, all the calicinal divisions ovate, 2 mm. long and apically acute; corolla red, bilabiate, glandular-puberulent, the tube conic, 2 cm. long, basally coarctate, the lobes 5, rotundate, shortly fulvous-pilose, marginally ciliate; stamens equaling the corolla; anther thecae parallel; style glabrous, slightly surpassing the stamens; stigma unequally bifid; ovary externally apically pubescent; fruit not known.

This species is based on an unnumbered Poilane collection from between Lang-lut-ha and Lang-pa-ka, in the province of Quantri, at 700 m. altitude, Annam, Vietnam. Dop (1933) comments that "Ce collecteur ajoute que le bois non attaqué par les termites est utilisé pour la confection de colonnes. *G. annamensis* constitue une espèce qui se distingue de tous les *Gmelina* asiatiques par la bilabiation très nette de sous calice, qui rappelle tout à fait un calice de Labiées. Les corolles rouges permettent en outre de la distinguer facilement." He cites the vernacular name, "cây cle".

The species is known thus far only from the original collection. Dop (1933) distinguishes it from the other Indochinese species recognized by him as follows:

1. Calyx distinctly dentate or lobed.
2. Calyx regular or only slightly bilobed.
3. Ovary glabrous; calyx-lobes much shorter than the tube.....
G. arborea.
- 3a. Ovary pubescent; calyx-lobes much longer than the tube.....
G. hainanensis.
- 2a. Calyx plainly bilobed.....*G. annamensis*.
- 1a. Calyx truncate and entire.....*G. racemosa* (lecomtei).

GMELINA ARBOREA Roxb. ex J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 4. 1810.

Synonymy: *Cumbulu* Rheede, Hort. Malab., 1: 75, pl. 41. 1778.

Premna arborea Roth, Nov. Sp. Pl., imp. 1, 287--288. 1821 [not *P. arborea* (Forst. f.) Farwell, 1919]. *Gmelina arborea* L. ex Spreng. in L., Syst. Veg., ed. 16, 5 (2): 765. 1827. *Gmelina tomentosa* Wall., Numer. List. 87, no. 1817I. 1831 [not *G. tomentosa* Fletcher, 1938, nor Roxb., 1947]. *Gmelina rheedii* Hook., Curtis Bot. Mag. 74 [ser. 3, 3]: pl. 4395. 1848. *Gmelina arborea* Roxb. apud Wight, Icon. Pl. Ind. 4 (3): pl. 1470 sphalm. 1849. *Gmelina arborea* Wight apud Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 244. 1861. *Premna tomentosa* Miq. apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 581. 1885 [not *P. tomentosa* Blanco, 1845, nor Blume, 1885, nor F.-Vill., 1883, nor Kurz, 1877, nor Rottl., 1803, nor Willd., 1800]. *Premna tomentosa* Miq. ex Pételot, Bull. Econ. Indo-chine 37: 1295. 1934. *Gmelina arborea* J. E. Sm. apud Bakh. & Van Steenis, Taxon 5: 81. 1956. *Gmelina arborea* Qureshi in Joshi, Indian For. 95: 152 sphalm. 1969. *Gmelina arborea* Caudhuri, Bull. Bot. Soc. Beng. 23: 123 sphalm. 1969. *Gmelina arborea* Anon. ex Mold., Fifth Summ. 2: 523 in syn. 1971. *Gmelina arborea* Roxb. ex Mold., Fifth Summ. 2: 622 in syn. 1971. *Gmelina arborea* Wight ex Mold., Phytologia 25: 240 in syn. 1973. *Premna arborea* Roth ex López-Palacios, Pittieria 6: 15 in syn. 1974. *Premna tomentosa* Miq. ex López-Palacios, Pittieria 6: 15 in syn. 1974. *Gmelina arborea* Jayas. ex Mold., Phytologia 34: 274 in syn. 1976. *Gmelina arborea* Kowal & Kassam, Agric. Ecol. Savan. 237 sphalm. 1978. *Gmelina arborea* Rottb. ex Odebiyi & Sofowore, Lloydia 41: 245 sphalm. 1978. *Premna tomentosa* Miq. ex Mold., Phytol. Mem. 2: 432 in syn. 1980. *Gmelina arborea* var. *arborea* [Roxb.] ex H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 389. 1983.

Bibliography: Rheede, Hort. Malab. 1: 75, pl. 41. 1678; Rumpf, Herb. Amboin. 1: 129, pl. 40 (1741) and 2: 124, pl. 39. 1741; L., Sp. Pl., ed. 1, imp. 1, 2: 626. 1753; L., Gen. Pl., ed. 5, imp. 1, 526. 1754; N. L. Burm., Fl. Indica 132, pl. 39. 1768; Gaertn., Fruct. Sem. Pl. 1: 268, pl. 56, fig. 5. 1788; J. E. Sm. in Rees, Cyclop., imp. 1 [London] 16: *Gmelina* 4. 1810; Roxb., Hort. Beng., imp. 1, 46. 1814; Roxb., Pl. Coast. Coromand. 3: 41--47, pl. 246. 1815; Lam., Tabl. Encycl. Meth. Bot. [Illust. Gen.] 3: pl. 542. 1819; J. E. Sm. in Reed, Cyclop., imp. 2 [Philadelphia] 17: *Gmelina* 4. 1820; Roth, Nov. Sp. Pl., imp. 1, 287--288. 1821; Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 45. 1824; Sweet, Hort. Brit., ed. 1, 1: 323. 1826; Spreng. in L., Syst. Veg., ed. 16, 5 (2): 765. 1827; Wall., Numer. List 50

["49"], no. 1817. 1829; Loud., Hort. Brit., ed. 1, 245. 1830; Sweet, Hort. Brit., ed. 2, 417. 1830; Wall., Numer. List 87, no. 1817I; Loud., Hort. Brit., ed. 2, 245. 1832; Roxb., Fl. Indica, ed. 2, imp. 1, 3: 84--85. 1832; Bojer, Hort. Maurit. 258. 1837; J. Grah., Cat. Pl. Bomb. 158. 1839; Dillwijn, Rev. Hort. Mal. 3. 1839; Loud., Hort. Brit., ed. 3, 245. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Spach, Hist. Nat. Vég. Phan. 9: 232--233. 1840; D. Dietr., Syn. Pl. 3: 613. 1843; Voigt, Hort. Suburb. Calcut. 470. 1845; Walp., Repert. Bot. Syst. 4: 98. 1845; Schau. in A. DC., Prodr. 11: 638 & 680. 1847; Hook., Curtis Bot. Mag. 74 [ser. 3, 4]: pl. 4395. 1848; Wight, Icon. Pl. Ind. Orient. 4 (3): 12, pl. 1470. 1849; Wight, Spicil. Neilgherr. 2: pl. 193. 1851; W. Griff., Icon. Pl. Asiat. 4: pl. 443. 1854; W. Griff., Notul. Pl. Asiat. 4: 179 & 753. 1854; Twining, Illust. Nat. Ord. Pl. 2: 104. 1855; Schnitzl., Iconogr. Fam. Nat. Reg. Veg. 2: 137 Verbenac. [2]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 200 & 365. 1858; Dalz. & Gibs., Bomb. Fl. 201. 1861; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 244. 1861; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 2: 125 & 126, pl. 14, fig. 1--11 (1862) and 3: 255. 1863; Bocq., Rév. Verbenac. 125, 126 & 255, pl. 14, fig. 1--11. 1863; Lindl. & Moore, Treas. Bot., ed. 1, 538. 1866; Nördlinger, Querschn. 4: 23. 1867; Lindl. & Moore, Treas. Bot., ed. 2, 538. 1870; Kurz, Rep. Veg. Andam. App. A: 45. 1870; Beddome, Fl. Sylv. S. India pl. 253. 1872; Brandis, For. Fl. Northw. Cent. India 3: 364--365. 1874; Roxb., Fl. Indica, ed. 2, imp. 2, 486. 1874; Kurz, Prelim. Rep. For. Veg. Pegu 69--71 & App. A: xcv --xcviii (1875) and B: 70. 1875; Lindl. & Moore, Treas. Bot., ed. 3, 538. 1876; Kurz, For. Fl. Brit. Burma 2: 264--265. 1877; Gamble, List Trees Darjeel. Dist. 61 & 62. 1878; Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: Nov. App. 159. 1880; Gamble, Man. Indian Timb., ed. 1, xxvii, 295--296, & 509. 1881; J. Sm., Dict. Pop. Names Pl. 408. 1882; Dymock, Veg. Mat. Med. W. India, ed. 1, ix & 498. 1884; Lindl. & Moore, Treas. Bot., ed. 4, 538. 1884; C. B. Clarke in Hook. f., Fl. Brit. India 4: 581--582. 1885; For. Adm. Rep. Chutia Nagpur 6 & 33. 1885; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 69. 1885; Campbell & Watt, Descrip. Cat. Econ. Prod. Chutia Nagpur 52. 1886; Watt, Dict. Econ. Prod. India 3: 514--516. 1889; Collett & Hemsl., Journ. Linn. Soc. Lond. Bot. 28: 110. 1890; Baill., Hist. Pl. 11: 94. 1891; Dymock, Warden, & Hooper, Pharmacog. India, imp. 1, 3: [iii] & 70--72. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039 & 1040. 1893; Prain, Journ. Roy. Asiat. Soc. Beng. 62: 39--86. 1893; Anon., Gard. Chron., ser. 3, 15: 746. 1894; Nairne, Flow. Pl. West. India 246. 1894; Talbot, Syst. List Trees Shrubs Bomb., ed. 1, 161 & 221. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 133, 165, & 173. 1895; Maiden, Agric. Gaz. N. S. Wales 6: 289. 1895; Trimen, Handb. Fl. Ceyl. 3: 355. 1895; Lindl. & Moore, Treas. Bot., ed. 5, 538. 1899; J. L. Stewart, Punjab Pl. 166. 1899; Woodrow, Journ. Bomb. Nat. Hist. Soc. 12: 359. 1899; L. H. Bailey, Cyclop. Am. Hort. 2: 654. 1900; Gamble, Man. Indian Timb., ed. 2, imp. 1, 537--539 & 778. 1902; Prain, Bengal Pl., imp. 1, 829. 1903; T. Cooke, Pl. Presid. Bomb., ed. 1, 3: 424--425. 1905; Brandis, Indian Trees, imp. 1 & 2,

509 (1906) and imp. 2a, 509. 1907; Foxworthy, Philip. Journ. Sci. Bot. C.4: 554 & 576. 1909; Talbot, For. Fl. Bomb., ed. 1, 2: 348--350, fig. 451. 1909; Haines, For. Fl. Chota Nagpur 486--487 & 597. 1910; Woodrow, Gard. Trop., imp. 1 & 2 [Gard. India, ed. 6, imp. 7 & 8], 441. 1910; Brandis, Indian Trees, imp. 3, 509. 1911; Craib, Kew Bull. Misc. Inf. 1911: 443. 1911; Duthie, Fl. Upper Gang. Plain, ed. 1, 2: 220--221. 1911; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl., ed. 1, [Perad. Man. Bot. 2:] 69. 1911; Talbot, For. Fl. Bomb. 2: 349. 1911; Craib, Contrib. Fl. Siam Dicot. 164. 1912; Dunn & Tutchener, Kew Bull. Misc. Inf. Addit. Ser. 10: 203. 1912; Lace, List Trees Shrubs Burma, ed. 1, 64, 82, 128, & 133. 1912; R. S. Pearson, Comm. Guide For. Econ. Prod. India 52. 1912; C. B. Robinson, Philip. Journ. Sci. Bot. 7: 414 & 416. 1912; Rodger, Indian For. Bull., ser. 2, 16: 1--10. 1913; Dop, Bull. Soc. Bot. France 61: 322. 1915; E. D. Merr., Interpret Rumph. Herb. Amboin. 452 & 486. 1917; Basu, Indian Med. Pl., imp. 1, 3: 3, pl. 739. 1918; Firminger, Man. Gard. India, ed. 6, 2: 389. 1918; Hallier, Meded. Rijks Herb. Leid. 37: 55 & 58. 1918; Parker, For. Fl. Punjab, ed. 1, 398. 1918; Wiesner, Rohst. 2: 464. 1918; Dawkins, Indian For. 45: [505]--519, pl. 27 & 28. 1919; Farwell, Druggists Circ. 63: 50. 1919; Koman, Rep. Invest. Indig. Drugs 2: 50. 1919; H. J. Lam, Verbenac. Malay. Arch. 215, 216, 219--220, 365, & 366. 1919; Bose, Man. Indian Bot. 252 & 253, fig. 219. 1920; Cubitt, Rep. For. Admin. Fed. Malay St. 1920: 4. 1920; Smythies, Indian For. Rec. 7 (8): pl. 13. 1920; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 65, 68--69, & 71. 1921; Brandis, Indian Trees, imp. 4, 509. 1921; Hubert, Verb. Util. Mat. Med. 1921; Troup, Silvicult. Indian Trees 2: 769--776, fig. 294--297. 1921; Gamble, Man. Indian Timb., ed. 2, imp. 2, 537--539 & 778. 1922; Haines, Bot. Bihar Orissa, ed. 1, 4: 715 & 719. 1922; Parkinson, For. Fl. Andam. Isls., imp. 1, 219. 1922; Rodger in Lace, List Trees Shrubs Burma, ed. 1, 131. 1922; E. D. Merr., Enum. Philip. Flow. Pl. 3: 400. 1923; Spever, Bull. Ent. Res. 14: 11--23. 1923; Colthurst, FamiliaR Flow. Trees India 120--122. 1924; Gamble, Fl. Presid. Madras 6: 1097 & 1098. 1924; Haines, Bot. Bihar Orissa, ed. 1, 6: 1296. 1924; Kaneh., Indian Woods 17. 1924; Parker, For. Fl. Punjab, ed. 2, 398. 1924; L. H. Bailey, Stand. Cyclop. Hort., imp. 1, 2: 1353. 1925; Boddington, Mem. Asiat. Soc. Beng. 10: 1, 3, 4, 6, 13--15, 38, 61, 75, 76, 90, 96--99, 105, 113, & 117. 1925; Chaudhuri, Indian For. 51: 57--60. 1925; Van der Merwe & Kent., Journ. Dept. Agric. Union S. Afr. 10: 29--42. 1925; Wangerin, Justs Bot. Jahresber., 53 (2): 644. 1925; Lecomte, Gov. Gén. Indoch. Publ. Agenc. Econ. 13: 199. 1926; Boddington, Mem. Asiat. Soc. Bent. 10: 136, 152, 191, 193, 197, 220, 244, 252, 276, 282--284, 287--290, 294--296, & 300--302. 1927; Osmaston, For. Fl. Kumaon 408--409. 1927; Bois, Pl. Aliment. 2: 440. 1928; J. M. Cowan, Rec. Bot. Surv. India 12: 29--34, 47, & 48. 1929; Pflueger, Rev. Internat. Bot. Appliq. Agric. Trop. 9: 726--730 & 794--798. 1929; Allsop, Indian For. 56: 203--211. 1930; L. H. Bailey, Stand. Cyclop. Hort., imp. 2, 2: 1353. 1930; L. H. & E. Z. Bailey, Hortus, ed. 1, 279. 1930; Rao, Agric. Journ. India 25: 17--25. 1930; Stapf, Ind. Lond. 3: 299. 1930; Alston in Trimen, Handb. Fl. Ceyl. 6: Suppl. 232. 1931; Normand, Rév. Internat. Bot. Appliq. Agric.

Trop. 11: 168--174, pl. 3. 1931; Rodger in Lace, List Trees Shrubs Burma, ed. 3, 202. 1931; G. F. Weber, Phytopath. 21: 1129--1140. 1931; Ali, Journ. Bomb. Nat. Hist. Soc. 35: 597. 1932; Chopra, Rep. Indig. Drugs Enquiry 34. 1932; Krishna & Ramaswami, Indian For. Bull., ser. 2, 79: 17. 1932; Pearson & Br., Commerc. Timb. India 2: 799 & 802. 1932; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 116--120. 1932; L. H. Bailey, Stand. Cycl. Hort., imp. 3, 2: 1353. 1933; Dop, R  v. Internat. Bot. Appliq. Agric. Trop. 13: 893--896. 1933; Charlton, Proc. 4th Silv. Conf. Dehra Dun 78--87. 1934; Crevost & P  telot, Bull. Econ. Indo-chine 37: 1295. 1934; J. C. M. Gardn., Indian For. Rec. 20 Ent. 1--42. 1934; Naidu, Comm. Timb. India 73. 1934; Pearson & Br., Commerc. Timb. India, imp. 2, 2: 799 & 802. 1934; H. E. Thomas, Journ. Agric. Res. 48: 187--218. 1934; Wagle, Agric. Ligest. India 4: 176--188. 1934; L. H. Bailey, Standl. Cyclop. Hort., imp. 4, 2: 1353. 1935; L. H. Bailey, List Florists Handl. Verbenac. [mss.] 1935; L. H. & E. Z. Bailey, Hortus, ed. 2, 279. 1935; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1932--1934, pl. 739. 1935; Dop in Lecomte, Fl. G  n. Indo-chine 4: 842--844. 1935; Mathur, Indian For. Rec., ser. 2, 1 (2): 35--70. 1935; Trevor, Emp. For. Rev. 14: 25--26. 1935; Sharples, Diseases Pests Rubb. Tree. 1936; Bell & Scott in Taylor & Francis, Fauna Brit. India Moths 5. 1937; Caresche, Trav. Inst. Rech. Agron. Indo-chine 1935/36: 192--212. 1937; Alston, Kandy Fl. 64, fig. 345. 1938; W. A. Campbell, Bull. Torr. Bot. Club 65: 31--69. 1938; Fletcher, Kew Bull. Misc. Inf. 1938: 404 & 422. 1938; Garthwaite, Indian For. Rec., ser. 2, Ent. 5: 237--277. 1939; Kanjilal, Das, Kanjilal, & De, Fl. Assam, imp. 1, 3: 466--467. 1939; Sevastopulo, Journ. Bomb. Nat. Hist. Soc. 40: 391--408 & 681--692. 1939; Subramanian, Journ. Bomb. Nat. Hist. Soc. 40: 257--263. 1939; A. V. Thomas, Mal. For. 8: 84--85. 1939; Fedde & Schust., Justs. Bot. Jahresber. 59 (2): 261 (1939) and 59 (2): 546. 1940; Golding, Bull. Ent. Res. 30: 543--550. 1940; Mold., Prelim. List Comm. Names 12. 1940; Mold., Suppl. List Comm. Vern. Names 2, 4, 6, 8--12, 17--22, & 24. 1940; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 332. 1941; Beeson, Ecol. Control For. Insects India. 1941; Biswas, Indian For. Rec. 3: 42. 1941; F. G. Browne, Mal. For. Rec. 22. 1941; Durant, Mal. For. 10: 89--92. 1941; E. D. Merr., Brittonia 4: 171--172. 1941; Wangerin & Krause, Justs Bot. Jahresber. 60 (1): 704. 1941; Bor, Indian For. Rec. 3: 152--195. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 55--57, 59, 60, 73, & 93. 1942; Limaye, Indian For. Rec., ser. 2, Util. 3 (5): 16. 1944; Menninger, Descrip. Cat. Flow. Trop. Trees 16. 1944; Trotter, Common Commerc. Timb. India 109. 1944; Mold., Phytologia 2: 103. 1945; Sontakay, Indian Fmg. 6 (2): 74--75. 1945; Benthall, Trees Calcut., imp. 2, 353--354. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039 & 1040. 1946; Menninger, 1947 Cat. Flow. Trees 19. 1946; Razi, Journ. Mysore Univ. 7 (4): 64. 1946; Chowdhury, Nature 160: 609. 1947; Gamble, Jt. Publ. Imp. Agric. Bur. 10: 117. 1947; Mold., Alph. List Inv. Names Suppl. 1: 10. 1947; H. N. & A. L. Mold., Pl. Life 2: 78. 1948; Van Rensselaer, Trees Santa Barbara, ed. 2, 169. 1948; Dordi, Indian Text. Journ. 59: 708. 1949; Karanchandan, Indian For. 75: 505--511. 1949; Mold., Known Geogr. Dis-

trib. Verbenac., ed. 2, 117, 125, 127--130, 132, 136, 137, 139, 160, & 186. 1949; Sri Gulabkunwarbi, Charak Semhita. 1949; Metcalfe & Chalk, Anat. Dicot. 2: 1040. 1950; Kalshoven, Plagen Cultuurgew. Indones. 1950/1951; Albert, Inst. Franç. Afr. Noir Mém. 15: 1--174. 1951; Corner, Wayside Trees, ed. 2, 702. 1952; Dastur, Indian For. 78: 275 & 365. 1952; Dastur, Med. Pl. India 126--127. 1952; Dastur, Useful Pl. India Pakist., ed. 6, 117--118. 1952; Guillaumin, Bull. Mus. Nat. Hist. Nat. Paris, ser. 2, 23: 539. 1952; Mold., Phytologia 4: 54. 1952; Pelt, Candollea 13: 248. 1952; V. S. Rao, Journ. Indian Bot. Soc. 31: [297], 308, 309, 312, & 313, fig. 50--54. 1952; Bagchee, Indian For. 79: 17--24. 1953; Dale, Descrip. List Introd. Trees Uganda 43--44 & 72. 1953; Kedare & Tendolkar, Journ. Sci. Indust. Res. 12B: 125 & 217. 1953; Menninger, 1953 Cat. Flow. Trees 40. 1953; Pételot, Pl. Méd. Cambod. Laos Vietn. 2 [Arch. Rech. Agron. Past. Vietn. 18]: 252. 1953; Pichon, Taxon 2: 111. 1953; Purushotham & al., Indian For. 79: 43. 1953; Roig, Dicc. Bot. Nom. Vulg. Cub. 73, 74, & 550. 1953; Santapau, Pl. Saurashtra 31. 1953; Setten, Mal. For. 15: 165--169. 1953; Travancore Univ., Pharmacog. Ayurvedic Drugs, ser. 1, 2: 65. 1953; Bagchee, Indian For. Rec., ser. 2, Mycol. 1 (8): 99--184. 1954; Doanay, For. Inst. Oxford Spec. Subj. 1954; Fritz, Biol. Abstr. 28: 440. 1954; Mathur & Singh, For. Bull. Dehra Dun, ser. 2, Ent. 171: pts. 1--10. 1954/61; Mold., Journ. Calif. Hort. Soc. 15: 86. 1954; Petelot, Pl. Med. Cambod. Laos Vietn. 4: 20, 26, 28, 36, 38, 59, 63, 119, 224, & 239. 1954; Phillips, For. Dept. Nigeria Inf. Bull. 14: 1. 1954; Santapau, Indian For. 80 (7): 387. 1954; Seth, Princip. Grassl. Types. 1954; Vuillaume, Rév. Pathol. Vég. Entom. Agric. Franç. 33 (3): 122--198. 1954; Barnard, Emp. For. Rev. 34: 68--77. 1955; R. S. Rao, Biol. Abstr. 29: 1223. 1955; Santapau, Journ. Gujerat Res. Soc. 17: 39. 1955; Santapau & Raizada, Indian For. Rec., ser. 2 Bot. 4 (6): 157. 1955; Bakh. & Van Steenis, Taxon 5: 81. 1956; Barnard, Biol. Abstr. 30: 1111. 1956; Chopra, Nayar, & Chopra, Gloss. Indian Med. Pl. 126. 1956; Parker, For. Fl. Punjab, ed. 3, 398 & 580. 1956; Sastri, Wealth India 4: 154--155, fig. 71 & 72. 1956; Anon., Biol. Abstr. 29: 3291. 1957; Santapau, Fl. Purandhar 104 & 153. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14357. 1958; Anon., Biol. Abstr. 30: 3983. 1958; R. N. & I. C. Chopra, Handa, & Kapur, Indig. Drugs India, ed. 2, 509, 600, 607, 608, 610, 675, & 804. 1958; Chowdhury & Ghosh, Indian Woods 1: xxx, xlii, & 150. 1958; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 2, 504--505. 1958; Kalshoven, Ent. Ber. Amst. 18: 147--160. 1958; Mensbruge, Proc. 2nd Inter Afr. For. Conf. Pointe-Noire 2: 460--463. 1958; Sriburi, Vanasarn 16 (2): 69--72. 1958; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Anon., Kew Bull. Gen. Ind. 134. 1959; Dastur, Med. Pl. India Pakist. 126. 1959; Kribs, Comm. For. Woods, ed. 2, 160, fig. 330. 1959; LePelley, Agric. Insects 1--307. 1959; Mold., Résumé 144, 159, 163, 165--167, 170, 176, 178, 180, 218, 276, 296, 297, 337, 339, & 456. 1959; Newsam & Rao, Journ. Rubb. Res. Inst. Malaya 15: 209--215. 1959; Parameswaren Nayar, Bull. Bot. Surv. India 1: 124. 1959; G. Taylor, Ind. Kew. Suppl. 12: 63. 1959; Uphof, Dict. Econ. Pl., ed. 1, 171. 1959; Willan, Nyasal. Fmr. For. 5 (1): 15--17. 1959; Worthington,

- Ceyl. Trees 345. 1959; Chowdhury & Ghosh, Indian Woods 2: 190. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039 & 1040. 1960; Menninger, 1960 Price List Flow. Trees [4]. 1960; Nath, Bot. Surv. South. Shan States 305. 1960; Ogbe, For. Inst, Oxford Spec. Com. 1960; Petroff & Doat, Cent. Techn. For. Trop. Publ. 19: 71--88. 1960; Puri, Indian For. Ecol. 1: 40, 43, 173, 177, 183, 215, 228, 260, & 284 (1960) and 2: 406, 625, & 670. 1960; Riney & Child, Proc. 1st Fed. Sci. Cong. Salisb. 291--299. 1960; Anon., World Paper Trade Rev. 156: 1946. 1961; Boyle, Phytopath. 51: 117--119. 1961; W. E. Cooper, Phytopath. 51: 113--116. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; Guha & Saxena, Res. Ind. 6 (8): 280. 1961; Haines, Bot. Bihar Orissa, ed. 2, 2: 754. 1961; W. V. Harris, Termites. 1961; Hundley & Ko in Lace, List Trees Shrubs Burma, ed. 3, 202. 1961; Irvine, Woody Pl. Ghana 756. 1961; Mold., Phytologia 8: 14. 1961; Mathur & Singh, Indian For. Rec. Ent. 10 (6): 1117--1118. 1961; Rangaswami & Venkata Rao, Proc. Indian Acad. Sci. 54: 51. 1961; Satmoko in Wyatt-Smith & Wycherley, Nat. Conserv. West. Malaysia 210. 1961; G. H. Watkins, Phytopath. 51: 110--113. 1961; E. West, Phytopath. 51: 108--109. 1961; Gaussen, Legris, & Viart, Ind. Council. Agr. Res. Veg. Map Ser. 1: 28, 31, 32, & 41. 1962; Gledhill, Check List Flow. Trees Sierra Leone 30. 1962; Hocking, Excerpt. Bot. A.5: 44 & 45. 1962; S. & G. Manguenot, Rev. Cytol. Biol. Vég. 25: 446. 1962; Menninger, Flow. Trees World 283--284 & 298. 1962; Mold., Biol. Abstr. 37: 1062. 1962; Mold., Résumé Suppl. 3: 17 & 28 (1962) and 4: 7. 1962; Nair & Rehman, Bull. Nat. Bot. Gard. Lucknow 76: 13, 16--18, & 23, pl. 2, fig. 10, text-fig. 22. 1962; Raman & Kesavan, Nucleus 5: 123--126. 1962; Schedl, Revist. Ent. Mocamb. 5: 597-1352. 1962; Singh, Bull. Nat. Bot. Gard. Lucknow 69: 57. 1962; Streets, Exot. For. Trees Brit. Comm. 398--401. 1962; F. White, For. Fl. North. Rhodes. 368. 1962; Deb, Bull. Bot. Surv. India 5: 51--53. 1963; Eidt, FAO Publ. 1775: 1--68. 1963; Huber, Hepper, & Meikle in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432. 1963; Jain, Bull. Bot. Surv. India 5: 357--359. 1963; Joseph, Bull. Bot. Surv. India 5: 293. 1963; Kalshoven, Ent. Ber. Amst. 23: 90--100. 1963; Legris, Trav. Sect. Sci. ent. Techn. Inst. Franç. Pond. 6: 190, 192, 240, 506, 511, 516, 525, 542, & 567. 1963; Maheshwari, Fl. Delhi 282. 1963; B. A. Mitchell, Mal. For. 26: 259--286. 1963; Mold., Dansk Bot. Arkiv 23: 90. 1963; Prain, Beng. Pl., imp. 2, 2: 619. 1963; Raman & Kesavan, Sci. Cult. 29: 413--414. 1963; Sweeney, Bull. Dept. Agric. Nyasal. Prot. 21. 1963; Anon., Sympos. Internat. Dang. Dis. Insects. 1964; Anon., Fmr. For. 6 (3): 13--22. 1964; Bakh. & Van Steenis, Taxon 5: 31. 1964; A. Banerjee in Lahiri, West Beng. For. 48 & 54. 1964; W. Banerjee in Lahiri, West Beng. For. 91. 1964; Cave, Ind. Pl. Chromos. Numb. 2: 330. 1964; Chittenden, Coursey, & D. G. & J. O. Rotibi, Tappi 47 (12): 186A--192A (1964) and 12: 12. 1964; Choudhury in Lahiri, West Beng. For. 130. 1964; Crossley & Ogunle, Res. Rep. Inst. Indust. Res. Nigeria 28: 1--4. 1964; Das in Lahiri, West Beng. For. 253. 1964; Ghosh in Lahiri, West Beng. For. 114, 195, & 197. 1964; Jain, Proc. Nat. Inst. Sci. India 30: 68. 1964; Lee, Mal. For. 27: 370--374. 1964; Menninger, 1964 Seed List [2]. 1964; Mathur, Indian Journ. Ent. 1964: 437--455. 1964.

[to be continued]

HELIANTHEMUM ROSMARINIFOLIUM AND OENOTHERA TRILOBA
IN LOUISIANA

D.T. MacRoberts
Louisiana State University in Shreveport

Thomas and Allen (1982) specifically exclude from the flora of Louisiana the species *Helianthemum rosmarinifolium* Pursh (*Cistaceae*), and *Oenothera triloba* Nutt. (*Onagraceae*). Their basis for inclusion in their list, which includes "plants from literature," is not compatible with that for exclusion: "no herbarium specimen from the state has been seen."

Helianthemum rosmarinifolium was reported from Caddo Parish (MacRoberts 1979) and is represented by specimens in LSUS (MacRoberts 560, 1774, 2337, 3061). It is uncommon to locally common.

Oenothera triloba has not been reported for Louisiana but there are four sheets of a collection from Bossier Parish (Cockrell 168) in the LSUS herbarium. It is apparently very uncommon in Louisiana although known from surrounding states.

MacRoberts, D.T. 1979. Checklist of the plants of Caddo Parish, Bull. Mus. Life Sci., LSU in Shreveport, No. 1.

Thomas, R. Dale and C.M. Allen. 1982. A preliminary checklist of the Dicotyledons of Louisiana. Contr. Herb. Northeast Louisiana University, Monroe. No. 3.

BOOK REVIEWS

Alma L. Moldenke

"McGraw-Hill CONCISE ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY" edited Sibyl P. Parker, Editor-in-Chief & Staff, lxxiv & 2065 pp., 1,600 b/w photo. & line-draw., ca. 800 charts, tabs., maps & graphs. McGraw-Hill Book Company, New York, N. Y. 10020. 1984. \$89.50.

In 1983 there appeared the excellently prepared 5th edition of this encyclopedia in a shelfful of 15 volumes. In 1984 there is presented this concise edition, condensed succinctly and with a little updating, in a single volume by the same editorial staff. If one does not have the space, price or time for the many-volumed encyclopedia, this concise one will prove an excellent substitute because it contains so much of the essential content and so many of the special features such as identification of contributors, data bases, classification of living organisms, abbreviations, acronyms, signs, constants, symbols and conversion factors. The 7,300 alphabetically arranged entries are printed clearly, often effectively illustrated, and written with interest and clarity. This is an excellent publication!

"THE GEOLOGY AND LANDSCAPES OF NEW JERSEY" by Peter E. Wolfe, xii & 351 pp., 126 b/w photo., 52 fig., 36 maps & 5 tab. Crane, Russak & Company, Inc., New York, N. Y. 10017. 1977. \$22.50.

For the geologists (professionals, teachers, students) interested in the "how" and "what" of this state's formation and appearance, -- for the ecologists, field scientists of many different interests and amateur naturalists interested in "why" certain living things grow here and not there, and for the intelligent residents and visitors who want to know more about the "where" and the beauty of the vistas around them -- it is indeed fortunate that this book is still available. This review copy is going to get a plastic cover and a handy place in the Moldenke car for consultation and direction for short drives throughout the state. The twelve well illustrated and well referenced chapters deal with New Jersey as a drifting continent, distribution of Precambrian rock types, Paleozoic volcanic rocks, Mesozoic Palisades and Watchung lava flows, Cenozoic last ice age, well pictured and described landscapes from peneplains to coastal plains and shorelines, and much more. This is an excellent publication.

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BOTANICAL GARDEN

MAN-CREATED STABLE LOW VEGETATION UNDER A ROADSIDE UTILITY LINE NORFOLK, CONNECTICUT

John P. Anderson, Jr. and Frank E. Egler
Aton Forest, Norfolk, Conn. 06058

INTRODUCTION

The purpose of this paper is to describe the results of 37 years of observation and management of the vegetation under a utility line along a 1-1/4 mile length of the rural North Colebrook Road in Norfolk, Connecticut. This paper is also a progress report on this area since the vegetation continues to be observed and managed, and because Vegetation is always dynamic. The road has been under botanical and sociological observation with respect to town government and utility corporation management, since 1946 under Egler's partial influence with respect to the management, since 1968 under scientific management for the root-killing of remaining unwanted trees. With the aid of a much appreciated grant from the Electric Power Research Institute for 1982 and 1983, this root-killing has involved the research use of Picloram with 2,4-D (Dow's Tordon RTU diluted to half-strength), and is now essentially completed. The critical problems of obtaining a stable non-tree vegetation under the wires goes back in history to early mis-management practices - typical of most of New England, and thus those situations are summarized in this paper.

The road lies in an area of the beech-birch-maple-hemlock forest Zone (Egler, 1940) characterized by beech (Fagus grandifolia), yellow birch (Betula lutea), sugar maple (Acer saccharum), and hemlock (Tsuga canadensis), white pine (Pinus strobus) in the old pastures, and with red maple (Acer rubrum) generally common throughout and often a dominant on wet sites. (The so-called "Northern Hardwood Forest" is not considered a suitable scientific concept; it is a physiognomically-determined Cover Type that exists in several distinct Zones.) Hickories and oaks (except red oak, Quercus rubra) are absent, except on some of the higher, drier "southern-like" monadnockoid summits. The results of this study can be extrapolated to other parts of the Zone in the Northeast, especially the lower elevations of the Adirondacks, the Green Mountains and the White Mountains, as well as to analogous parts of the southern Appalachians.

HISTORY

The history of North Colebrook Road begins in the late 1700's and the founding of the Town of Norfolk. At peak population there were seven subsistence farms on the road, together with a one-room schoolhouse, with no mature forests adjacent to the road. In 1925 there were still three working farms, producing milk as

a "cash crop". The last farm was abandoned after the home burned in 1935. The road was black-topped in the early 1950's.

Town management of the roadsides is typical of many towns in Connecticut; it is now done with back-hoe/bucket loaders, mowing machines, a minimum of hand-labor, and little knowledge of the plant-life. (A serious effort was made by Egler to cooperate with the Town in the 1950's, but it was not successful, nor have other efforts since then been successful.) Winter sanding, spring sweeping of the sand to the sides, occasional re-surfacing and patching and heavy sanding, together with earth-moving operations without regard for the sites, have left crushed blacktop edges, small "levees" of brushed-aside sand, the original drainage ditch filled, unsightly piles and gouges, and taller vegetation at the outer margins.

Utility company management in general, until recent years, has resulted in the perpetuation, if not an increase, in the vegetation problems under the wires. Two decades ago, it was standard engineering specifications of the utility companies, for implementation by the brush-control contractors, to remove all vegetation within three feet of the wires. This resulted in two effects: an unsightly under-the-wire "crewcut", or a "tunnel" thru the forest canopy. With this practice, vegetation has to be repruned every three years to maintain the proper minimum distance from the wires. No attempt was ever made to remove the entire population of under-the-wire trees, only those branches that might reach the wires in the next three years. However, the crews of the contractor would generally comply with the personal requests of an adjacent landowner if they did not interfere with their minimum-distance-from-the-wire goal.

Scientific Roadside Vegetation Management was first begun on a phone line coming from the east (the Town of Colebrook) which has since been removed. In the 1940's, since selective basal dormant spraying with a herbicide/oil mixture had been shown effective, Egler treated all the basal tree sprouts, and even those of all shrubs, in the 180 feet between poles. Brush was purposely left surrounding each pole, as a demonstration to the utility company personnel (which they never noticed). By the early 1950's, phone service was switched to that coming from the west; the line was removed, but to this day there is a cluster of trees where each pole had been.

From 1968 on, Egler took over the task of tree removal under the utility lines along North Colebrook Road. Originally this was accomplished by cutting with a brushhook, and girdling the larger trees. For this road, it was usually found that the crews of the contractors were intelligent, or at least cooperative (tho they were not formally or legally obligated to comply). It was requested

(1) that they cut no "ground brush" (trees rooted under the wires); and (2) that they limit their activities to clear-boling the adjacent trees (cutting off the side-limbs close to the trunk, thus eliminating repeated pruning of those branches and improving the esthetic appearance).

Beginning in 1980, the Tordon root-killing project was expanded to include the stable, low, under-the-wire roadside vegetation of North Colebrook Road. At this time, the brush-control crew was scheduled for its three-year-retreatment of this road. They cooperated fully with Egler: they helped to selectively cut, and to spray with Tordon, the larger trees. In 1983, when the same crew foreman came thru for an inspection, he decided that no treatment was needed. This was the first time in his experience that any such rural road did not need the customary three-year-treatment, this despite the company forester's objections that this is the "worst" roadside, in terms of "brush", in the town.

Since the root-killing aspect of this work ("plant-community construction") is essentially completed, emphasis in this paper focuses upon the composition and structure of the remaining plant-communities, with economic concern for the future maintenance activities. There is nothing new or unusual in this scientific approach for roadsides (Egler 1953, 1957, 1961, 1971, 1973, 1975, 1979). The idea is entirely compatible with our scientific knowledge of the long-term stability of many scrublands around the world: chaparral, garrigue, fynbosch, heath balds, etc. (Egler 1977, Niering and Egler 1955, Pound and Egler 1953, Egler and Anderson 1982, 1983 in press).

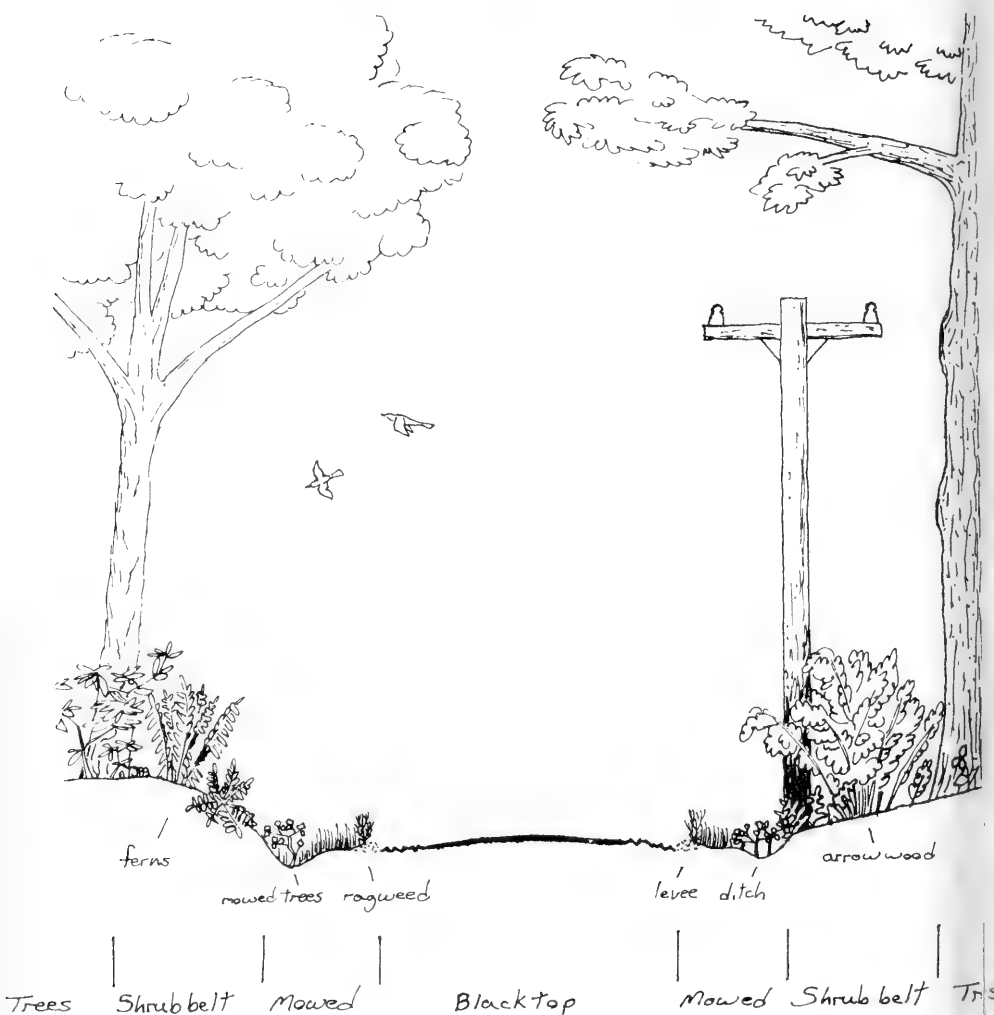
STUDY AREA

The study area is composed of 25 of the 28 spans between utility poles of a 1-1/4 mile section of North Colebrook Road (three spans were in lawn or mowed grassland). The spans are variable in width but average about 8 feet (range: 4 - 12 feet). Since the line frequently crosses the road, the roadbed is then under the wires. This factor is compensated by the fact that actual Vegetation Management was extended on either side up to the point where the line crossed the middle of the road. Lengthwise, the line is divided into 25 spans. Each span was designed (by the utility company) to be about 200 feet long. The road for the most part runs east-west.

A generalized cross-section of the road (Fig. 1) indicates the Belts under consideration:

1. The blacktop pavement is servicable but requires annual maintenance, in part because of mis-use by the Town itself. The road's shoulder begins here and blends into part of the next Belt.

Road Cross-Section



2. The mowed strip is one-cutter-bar wide (but sometimes unnecessarily two wide). It is rough, stony, with a line of ragweed at the pavement edge, and an assortment of herbs and small trees elsewhere.

3. The shrub belt is the site of this special study, composed of what shrubs nature has put there, plus what herbs are under or between the shrubs. No species need to be planted by landscapers.

4. Beyond the shrub belt lies the tree belt --the forest-- on town or private property. The trees on the edge of the shrub belt have been clear-boled, producing tall, straight trunks, with high, large, healthy branches overarching the wires (which is actually protection to the wires in severe weather).

METHODS

Refer to Egler and Anderson (in press) for the root-killing research on trees under the wires. For this plant-community study, the road was walked and notes recorded by both investigators on five days in September and October, 1983, for a total of approximately 34 man/hours. All shrub species and all significant or obvious herbaceous species within the Shrub Belt of each span (with each span considered one study unit) were identified and given an Abundance rating: Abundant (patches or the aggregate of spaced individuals which have a ground coverage or canopy of at least 25% by ocular estimate), Rare (single individuals, few scattered individuals and very small groups which cover less than 5% of a span); Intermediate (all others). Site conditions and special notes were recorded for each unit. Newly invading trees were carefully watched for. Observations of the line as a whole were also recorded.

The field data have been purposely restricted to species identification, ocular estimate of Abundance, plus descriptive comments. It is the opinion of the authors that these are fully adequate, since the entire study area was surveyed (not sampled), because of the authors' long and intimate familiarity with the roadside vegetation and its history, and because this is a paper which expresses the link between basic research and the subsequent application of a method by technicians and professionals managing R.O.W.'s.

RESULTS

Forty species of shrubs and small trees and 62 species of herbaceous plants were involved in the study units. Most were Rare under the utility line (25 of the woody plants and 50 of the herbs). Only 10 woody plants and 7 herbs were recorded as being Abundant at least once. Five to 10% of the line was sparsely vegetated (having some bare soil). Approximately one quarter of all study units combined were covered with Patches. (A Patch being loosely defined as one or more individuals of one plant species

which are predominant in an area, to the general exclusion (90% pure) of all other species, and dense enough so the ground is entirely covered. So called Patches of herbs and low shrubs here cover areas of at least 25 square feet and larger shrubs at least 100 square feet).

Nearly all sites had well drained soils. Only one study unit, and less than half of it, was on poorly drained soil and had two wetland species: the blue swamp aster (Aster puniceus) and a sedge (Carex crinita). No sites were classified as excessively drained, i.e. "arid". Most sites were characterized as light shade. Six sites were considered shady (two extremely so) and five sites were in bright light. These conditions were related to the height and density of the adjacent forests on both sides of the road. Thirteen and one half units were on the north side of the road and the remaining eleven and one half were on the south side.

In the Tree Belt adjacent to the Shrub Belt, the predominant tree species were red maple and white ash (Fraxinus americana). Other common trees were white pine, sugar maple and red oak. Hemlock deserves special note because, though infrequent, the average hemlock on this line creates dense shade, even across the road. All other tree species were incidental in occurrence and numbers, despite local influence.

Sensitive fern (Onoclea sensibilis) and arrowwood (Viburnum recognitum) were the two species which provided 16% and 7% of the total cover respectively, and occurred as Abundant more often than any other species. They also had the greatest overall occurrence (with the exception of choke cherry (Prunus virginiana)). Arrowwood composed the largest and most frequent Patches (the longest continuous Patch is 450 feet in length).

Species which were frequently classed as Patches, or scattered but of intermediate abundance, and therefore contributed importantly to the groundcover over the entire line, include: snakeroot (Eupatorium urticaefolium), interrupted fern (Osmunda claytoniana), lady fern (Athyrium filix-femina), choke cherry, and hay-scented fern (Dennstaedtia punctilobula). Other species which were important locally as Patches, though not necessarily rated as Abundant, and also of high Constancy (present in many study units) include: buckthorn (Rhamnus catharticus), meadowsweet (Spiraea latifolia), blackberry (Rubus allegheniensis), nannyberry (Viburnum lentago), maple-leaved viburnum (Viburnum acerifolium), witherod (Viburnum cassinoides), staghorn sumac (Rhus typhina), winterberry (Ilex verticillata), shadbush (Amelanchier arborea and A. laevis), and grape (Vitis labrusca). Other species which formed Patches but were apparently not spreading on the study area and occurring only at one location include: ostrich fern (Matteucia struthiopteris), tapering fern (Thelypteris noveboracensis),

orange day-lily and lemon day-lily (Hemerocallis fulva and H. flava), lilac (Syringa vulgaris), wild plum (Prunus americana), silky dogwood (Cornus amomum), and witch-hazel (Hamamelis virginiana).

DISCUSSION

This roadside is now a highly successful demonstration of ecologically sound Vegetation Management (Egler 1954, 1975, 1977). The vegetative and sexual reproduction of undesirable plant species under the utility wires has been arrested and at most sites is now essentially eliminated. We estimate that under-the-wire retreatment will not be necessary for at least 15 years, and even then the work will be substantially reduced when compared with those roadsides which are butch-cut and hole-cut and indiscriminately herbicided every three years. Some Patches on this line, on the basis of research by Niering and Egler (1955, restudied in 1983), may not need another treatment for 50 years.

For proper scientific Vegetation Management it is necessary not only to understand the characteristics and dynamics of Vegetation Types but also to understand how each species and community functions within its environment (in this case a casually managed roadside). The preferred Vegetation for under roadside utility lines is one of dense, stable shrublands and herblands (but NOT grasslands, which are seedbeds for several tree species, especially when mowed). Trees cannot be tolerated directly under the wires, however, trees alongside can be clear-boled. Low tree types are probably best avoided, but whether certain low trees are left should be decided on a species by species basis (for example, apples and shadbushes can generally be left for aesthetic and wildlife values, though they may need occasional top pruning).

The important species on the North Colebrook roadside are discussed below as to their form, structure, requirements, behavior, merits and disadvantages.

Sensitive fern. Grows to 2 feet. Is clonal, and spreads easily into disturbed areas (though a clone can be destroyed itself by disturbance) and into many plant communities (grasslands, under shrubs, etc.). They need never be mowed even when adjacent to the pavement. Found in full sun or shade, but heavy shade will cause it to die-out. Found in somewhat dry to occasionally wet sites, but does not occur in the extreme conditions of dry or wet. No other plant is yet known to invade and dominate a dense, healthy stand of this fern. Clones are generally long-lived. Benefits: soil stabilization; often considered aesthetically pleasing; fertile fronds and spores have some value as a wildlife food.

Arrowwood. Grows to 7 feet. Forms a dense clump of straight but flexible stems from a single crown (up to 10 feet in diameter). Will layer readily (large plants especially prone to this after

winter snows and ice bend the stems to the ground). Colonizes disturbed areas (mowed, grazed, plowed, and scraped lands) mainly by seeds distributed by birds. Found in sun or light shade (shading causes the plant to lose vigor and it will generally die-out under forests). Found in somewhat dry to occasionally wet sites, but not in the extremes. The canopy and root-system forms a dense groundcover; no woody species are known to invade a large, healthy stand of this shrub. It is long-lived in sunny locations. Benefits: attractive in form, flower and fruit; has a high wildlife value (birds and small mammals eat the fruits; insects feed on the nectar; deer and beaver feed on the stems - and can reduce or destroy a stand; provides cover for wildlife). Large plants are susceptible to winter storm damage, causing stems close to the road to lie in it, and in extreme cases flattening a stand (though generally this will resprout and layer). These large plants, after 20 years next to the pavement, may need cutting (but NOT root-killing).

Snakeroot. Grows to 3 feet. Is clonal; spreads as single stems, or sometimes several stems from one crown. Found in full sun or forest shade. Found on mesic sites. It often forms pure stands in the shade; most stands in full sun are a mixture with other herbs, though the snakeroot can be predominant. It is not generally found in shrub communities. This plant has recently become aggressive. It is not eaten by whitetail deer. Benefits: forms a groundcover and stabilizes soil in shady situations; when the plant is in blossom it can be attractive; the seeds provide some food for birds.

Interrupted fern. Grows to 4 feet. Is clonal but grows in clumps, with many fronds growing from one crown. Found on mesic to mostly wet (but not standing water) sites. Found in sun or shade. Not an aggressive spreader, but persistent once established. Benefits: aesthetically attractive. Should not be mowed.

Lady fern. Grows to 2 feet. Is clonal, spreading in clumps. Found in sun or shade. Found on many sites, but not in the extremes of wet or dry. Not an aggressive spreader, but can form a tight, complete groundcover. Benefits: aesthetically attractive. Should not be mowed.

Choke cherry. Grows rarely to 30 feet. Sometimes clonal; a cluster of stems is usually a clone. Found in sun or partial shade; does not tolerate the shading within most forest situations. Found on mesic to dry sites. Can be an aggressive spreader in grasslands and some other herblands, and in bare soil and disturbed areas. Seed is mostly distributed by birds. Benefits: attractive for its spring flowers; cherries provide food for birds and small mammals. In some areas and in some years it is attacked by tent caterpillars which can top kill the plant. This cherry's height has not been a problem under these utility lines, and dense clones do

not generally grow as rapidly or as tall as single individuals.

Hay-scented fern. Grows to 2 feet. Is clonal; fronds arise individually, not as a clump. Found in full sun or forest shade. Found on mesic to dry sites. A very aggressive spreader into most plant communities, except very dense shrublands and very dense conifer stands. This plant is not eaten by whitetail deer, and, therefore, may become much more abundant where high deer populations persist. A clone is extremely long-lived. Benefits: aesthetically attractive; a soil stabilizer. Not considered of any benefit to wildlife (perhaps provides some cover); no wildlife species is known to feed on this plant (though some invertebrates must, but there never seems to be any damage). The cover formed, though low, is very dense, making summer foot travel often difficult. It should not be mowed.

All other species mentioned in the Results section are important plants for creating non-forest, stable plant-communities in the Northeast. However, they have much less occurrence, abundance or importance on this local roadside than the above species. Many of their attributes are similar though, and abundances may shift over time.

Special mention should be made of certain alien plant species on this roadside because they are extremely stable and unusually colorful and appealing in bloom. The orange and lemon day-lilies are clonal, but, though persistent, they do not spread rapidly or aggressively often (except when the town scrapes clean the ditches or plows snow too close to the road edge and moves the plant's tubers into newly bared soil). Growth in the spring is early, providing a spot of green when it is most desired. The flowers bloom most of the summer, and the lemon day-lily is pleasantly scented. They can both form pure Patches, resisting all invasions, but they cannot survive long in too shady a site. They both bloom best in full sun. The orange day-lily does not produce seed or hybridize, but the lemon day-lily can produce hybrid seedlings if a different fertile clone is nearby. The day-lilies should not be mowed, but if they are within reach of the tractor's mowing bar, they usually are.

The Patches of lilac and plum occur near one another on this roadside and produce an impressive display and aroma in spring. Both are clonal, but are increasing only slowly in size. The older plums were severely affected by a bark disease in 1982. The plum rarely has produced seedlings; the lilac has never produced seeds. These two are found near an old homesite, as is usually the case with non-native ornamentals along roads.

Even relatively pure roadside Patches have a mix of various species within them. Sensitive fern often occurred with, and does well under, arrowwood as long as the stems remain somewhat up-

right. However, where the stems bend to the ground the fern thins or is non-existent. It is expected that as these shrubs become larger this loss of fern (and other species as well) will increase, thereby purifying this *Viburnum* community even more.

Under most other shrubs (with more upright growth) sensitive fern and the other common herbs occurred, generally thin and scattered, but frequently thriving. Meadowsweet and blackberry were two exceptions, never having a significant herbaceous layer under them when they occurred as Patches.

Other common local shrubs that would be very highly desirable, were they to have occurred under the wires, because of their ability to form stable communities include: high-bush blueberry (*Vaccinium corymbosum*), low blueberry (*V. angustifolium*), mountain laurel (*Kalmia latifolia*), sheep-laurel (*K. angustifolia*), gray and red-osier dogwood (*Cornus racemosa* and *C. stolonifera*), chokeberry (*Aronia melanocarpa*), flowering raspberry (*Rubus odoratus*), Japanese barberry (*Berberis vulgaris*), spicebush (*Lindera benzoin*), (*Phragmites communis*), the goldenrods (*Solidago*, several species), maleberry (*Lyonia ligustrina*), juniper (*Juniperus communis*), sweet-fern (*Myrica asplenifolia*), and beaked hazel (*Corylus cornuta*).

As mentioned in the Introduction to this paper, the results of this study can be extrapolated within the beech-birch-maple-hemlock Zone as described by Egler (1940, 1977). This Zone roughly parallels the southern boundary of the biome known as Taiga (and can be considered a part of it). At least in the eastern United States, all the important species of this study occur and will generally behave as described here. Specific extrapolation to other zones is not recommended since many of the species do not occur, may behave differently (such as not forming Patches or occurring only rarely and scattered), or other species not mentioned may hold greater promise for forming attractive, stable plant communities. However, the general principles shown by this study can be applied anywhere in the world, provided an understanding of the Vegetation of the study/management area is available. When it is known which plant-communities and species form stable communities, when it is known which species can prevent or disturb community stability, and when it is known how the various species and communities react to possible management practices, then choices can be made as to what is appropriate in many different situations needing management. Additionally, the results of this study can be extended beyond roadside utility line ROW's to provide some solutions to problems on any ROW, vistas, wildlife management areas, eroding sites, or any area where low, stable vegetation is desired (such as employed in naturalistic landscaping).

CONCLUSION

Now that techniques for root-killing undesirable plants have been proven, and these plants have been essentially eliminated from this study area, the desirability and long-term stability of various plant-communities can be reported (and be observed through the future). The species on this roadside today have obviously benefited from the removal of trees under the wires. Though shrubs (especially: arrowwood, choke cherry, buckthorn, nannyberry, blackberry, lilac, silky dogwood and meadowsweet) appear to offer the best resistance to tree invasion (and human disturbance), while at the same time being highly attractive, various herb communities can also be very stable (especially those containing: sensitive fern, snakeroot, interrupted fern, lady fern, hay-scented fern, ostrich fern, and orange day-lily). What this study shows us is that we can achieve management objectives under utility lines (and other situations requiring low vegetation) while the solution can be long-term, low-maintenance, attractive to humans and wild-life, and preserve diversity, a necessity for both people and the Earth as a whole.

Abundance ratings of all species on 25 study units of
North Colebrook Road, Aton Forest, Norfolk, Connecticut.

+ forms Patches on study area.

* alien species.

Species	Auth. 1.	Abundance 2.		
		Rare	Int.	Abun.
<u>Equisetum arvense</u> (common horsetail)	GI:13	3	1	0
<u>Osmunda regalis</u> (royal fern)	GI:25	1	0	0
<u>O. cinnamomea</u> (cinnamon fern)	GI:25	5	0	0
<u>O. claytoniana</u> (interrupted fern) +	GI:25	10	1	4
<u>Dennstaedtia punctilobula</u> (hay-scented fern)*	GI:28	2	2	3
<u>Pteridium aquilinum</u> (bracken)	GI:28	5	0	0
<u>Matteucia struthiopteris</u> (ostrich fern)+	GI:37	1	0	1
<u>Onoclea sensibilis</u> (sensitive fern)+	GI:37	10	5	8
<u>Athyrium filix-femina</u> (lady fern)+	GI:43	14	5	1
<u>Thelypteris phegopteris</u> (beech fern)	GI:48	4	0	0
<u>T. noveboracensis</u> (tapering fern)+	GI:48	1	0	0
<u>Dryopteris austriaca</u> (spinulose shield fern)	GI:52	1	0	0
<u>D. marginalis</u> (marginal shield fern)	GI:54	1	0	0
<u>Bromus catharticus</u> (brome grass)	GI:106	1	0	0
<u>Agropyron repens</u> (quack grass)	GI:139	1	0	0
<u>Brachyelytrum erectum</u> (woodland grass)	GI:180	1	0	0
<u>Carex crinita</u> (sedge)	GI:356	1	0	0
<u>Arisaema triphyllum</u> (Jack-in-the-pulpit)	GI:367	3	0	0
<u>Hemerocallis fulva</u> (orange day-lily)*+	GI:411	0	1	1
<u>H. flava</u> (lemon day-lily) *	GI:411	1	0	0
<u>Lilium canadense</u> (Canada lily)	GI:417	1	0	0
<u>Smilacina racemosa</u> (false Solomon's seal)	GI:426	2	0	0
<u>Convallaria majalis</u> (lily-of-the-valley)*	GI:431	1	0	0
<u>Trillium erectum</u> (red trillium)	GI:433	1	0	0
<u>Smilax herbacea</u> (carrion flower)	GI:435	3	0	0
<u>Salix discolor</u> (pussy willow)	GII:20	3	0	0
<u>Carpinus caroliniana</u> (bluebeech)	GII:32	4	0	0
<u>Alnus rugosa</u> (speckled alder)	GII:36	3	0	0
<u>Castanea dentata</u> (American chestnut)	GII:39	1	0	0
<u>C. crenata</u> (Japanese chestnut)*	B333,H231	1	0	0
<u>Urtica dioica</u> (stinging nettle) *	GII:54	1	0	0
<u>Asarum canadense</u> (wild ginger)	GII:61	1	0	0
<u>Polygonum cilinode</u> (fringed bindweed)	GII:84	1	0	0
<u>Actaea alba</u> (doll's eye baneberry)	GII:158	2	0	0
<u>A. rubra</u> (red baneberry)	GII:158	2	0	0

Table continued

Species	Auth.	Abundance Rating		
		Rare	Int.	Abun.
<u>Thalictrum polygamum</u> (meadow rue)	GII:161	14	0	0
<u>Anemone virginiana</u> (windflower)	GII:180	1	0	0
<u>Clematis virginiana</u> (virgin's bower)	GII:184	7	0	0
<u>Berberis thunbergii</u> (Japanese barberry)*	GII:190	6	0	0
<u>Lindera benzoin</u> (spicebush)	GII:193	1	0	0
<u>Sedum telephium</u> (live-forever) *	GII:257	1	0	0
<u>Tiarella cordifolia</u> (foamflower)	GII:265	2	0	0
<u>Ribes</u> sp. (gooseberry)	GII:274	1	0	0
<u>R. sativum</u> (garden currant) *	GII:279	1	0	0
<u>Hamamelis virginiana</u> (witchhazel)	GII:280	3	0	0
<u>Spiraea latifolia</u> (meadowsweet) +	GII:286	11	3	1
<u>Rubus allegheniensis</u> (blackberry) +	GII:310	9	1	2
<u>R. strigosus</u> (red raspberry)	GII:316	11	2	0
<u>Rosa</u> sp. (green-stemmed rose) * +	B534,H975	1	0	0
<u>R. multiflora</u> (multiflora rose) *	GII:323	6	0	0
<u>Prunus virginiana</u> (choke cherry) +	GII:329	15	6	3
<u>P. pensylvanica</u> (pin cherry)	GII:331	3	0	0
<u>P. americana</u> (wild plum) +	GII:332	0	0	1
<u>Pyrus malus</u> (apple) *	GII:335	9	0	0
<u>Amelanchier laevis</u> , <u>A. arborea</u> (shadbush) +	GII:377	9	1	0
<u>Amphicarpa bracteata</u> (hog peanut)	GII:450	0	1	0
<u>Rhus radicans</u> (poison-ivy)	GII:495	2	0	0
<u>R. typhina</u> (staghorn sumac) +	GII:496	3	1	2
<u>Ilex verticillata</u> (winterberry)+	GII:500	7	1	0
<u>Celastrus scandens</u> (bittersweet)	GII:502	1	0	0
<u>Acer spicatum</u> (mountain maple)	GII:507	5	0	0
<u>A. pensylvanicum</u> (striped maple)	GII:507	3	0	0
<u>Impatiens biflora</u> (touch-me-not)	GII:512	2	0	0
<u>Rhamnus catharticus</u> (buckthorn) * +	GII:514	3	0	2
<u>Vitis labrusca</u> (fox grape) +	GII:519	3	0	1
<u>Parthenocissus quinquefolia</u> (Vir.creeper)	GII:520	2	1	0
<u>Aralia racemosa</u> (spikenard)	GII:605	2	0	0
<u>Umbelliferae</u> (an Umbellifer)	GII:606	1	0	0
<u>Aegopodium podagraria</u> (goutweed)	GII:622	1	0	0
<u>Cornus alternifolia</u> (alt.-leaved dogwood)	GII:642	6	0	0
<u>C. amomum</u> (silky dogwood) +	GII:643	2	0	0
<u>C. stolonifera</u> (red-osier)	GII:644	1	0	0

Table, continued

Species	Auth.	Abundance Rating		
		Rare	Int.	Abun.
<u>Kalmia latifolia</u> (mountain-laurel)	GIII:14	2	0	0
<u>Vaccinium corymbosum</u> (highbush blueberry)	GIII:31	1	0	0
<u>Steironema ciliatum</u> (steironema)	GIII:40	1	0	0
<u>Syringa vulgaris</u> (common lilac) **	GIII:52	0	0	1
<u>Gentiana andrewsii</u> (bottle gentian)	GIII:63	1	0	0
<u>Asclepias exaltata</u> (milkweed)	GIII:75	1	1	0
<u>A. syriaca</u> (common milkweed)	GIII:76	6	0	0
<u>Prunella vulgaris</u> (self-heal)	GIII:154	1	0	0
<u>Viburnum acerifolium</u> (maple-leaved vib.)	GIII:292	1	1	0
<u>V. cassinoides</u> (witherod)	GIII:292	3	0	0
<u>V. lentago</u> (nannyberry) +	GIII:293	5	0	1
<u>V. dentatum</u> , <u>recognitum</u> (arrowwood)+	GIII:295	11	5	7
<u>Sambucus canadensis</u> (elderberry)	GIII:296	7	0	0
<u>Valeriana officinalis</u> (garden heliotrope)*	GIII:306	1	0	0
<u>Helianthus tuberosus</u> (Jerusalem artichoke)	GIII:337	1	0	0
<u>Solidago juncea</u> (summer goldenrod)	GIII:426	1	0	0
<u>S. rugosa</u> (rough-stemmed goldenrod)	GIII:430	19	1	0
<u>S. gigantea</u> (goldenrod)	GIII:432	2	0	0
<u>S. canadensis</u> (goldenrod)	GIII:432	2	0	0
<u>S. graminifolia</u> (grass-leaved goldenrod)	GIII:438	3	1	0
<u>Aster macrophyllus</u> (larger-leaved aster)	GIII:444	2	0	0
<u>A. divaricatus</u> (woodland white aster)	GIII:446	5	0	0
<u>A. puniceus</u> (marsh blue aster)	GIII:454	2	0	0
<u>A. umbellatus</u> (early tall white aster)	GIII:458	9	0	0
<u>A. lateriflorus</u> (small white field aster)	GIII:464	1	0	0
<u>A. simplex</u> (tall white field aster)	GIII:464	11	0	0
<u>Erigeron annuus</u> (annual erigeron)	GIII:472	2	0	0
<u>Eupatorium perfoliatum</u> (boneset)	GIII:491	2	0	0
<u>E. rugosum</u> , <u>urticaefolium</u> (white snakeroot)+	GIII:492	8	0	2
<u>Lactuca canadensis</u> (wild lettuce)	GIII:535	4	0	0

1. Authority on nomenclature; for further botanical information:
G - Britton and Brown Illustrated Flora, H. A. Gleason, 1948, or
B - Manual of Cultivated Plants, L.H. Bailey, 1949, or
H - Hortorium's Hortus Third, L.H. Bailey, 1976.
2. See Text, Page 4.

Bibliography

- Egler, Frank E. 1940. Berkshire Plateau Vegetation, Mass. Ecol. Monogr. 10 (2): 145-192.
- Egler, Frank E. 1953. Roadside brush control. An application of plant-community management. 28th National Shade Tree Conf. Prof. 1952: 59-70.
- Pound, Charles E., and Frank E. Egler, 1953. Brush control in southeastern New York: fifteen years of stable treeless communities. Ecology 34 (1): 63-73.
- Egler, Frank E. 1954. Vegetation Management for Rights-of-Way and Roadsides. From the Smithsonian report for 1953, pages 299-322. Smithsonian Institution, Washington, D.C.
- Egler, Frank E. 1957. Roadside spraying - boon or bane? Garden Club of America Bull. 45 (5): 57-60.
- Egler, Frank E. 1961. Roadside ragweed control knowledge and its "communication" between science, industry and society. Pp. 1430-1435 in Recent Advances in Botany. Univ. of Toronto Press: Toronto, Canada.
- Egler, Frank E. 1971. The Romance of Roadside Ragweed. N.Y. State Conservationist 26 (1):27.
- Egler, Frank E. 1973. Bibliography of (79) papers by F.E.E. concerning Rightofway Vegetation Management, Herbicides and Society. 8 p. Connecticut Conservation Association.
- Egler, Frank E. 1975. Plight of the Rightofway Domain. Victim of Vandalism. 2 vols. 294 p., 160 p. Futura Publishing Co., Mt. Kisco, N. Y. 10549.
- Egler, Frank E. 1977. The nature of vegetation. Its' management and mismanagement. 527 p. Egler: Norfolk, Ct. 06058.
- Egler, Frank E. 1981. R/W Management and Herbicides: an iatrogenic disease of the technologic age, 1949-1979. Key-note Address of Environmental Concerns in Rights-of-Way Management, Second Symposium, 1979: 18 p.
- Egler, Frank E. and John P. Anderson, Jr. 1982. Botanical studies in the stability of non-diversity: Cornus racemosa, Gray Dogwood. Conn. Botanical Soc. Newsletter 10 (3):1.

Bibliography, continued:

Egler, Frank E. and John P. Anderson, Jr. In press.
Botanical studies in the stability of non-diversity: Taxus cana-
densis, Yew. Third Symposium on Environmental Concerns in Rights-
of-Way Management, San Diego, Calif. 1982.

Egler, Frank E. and John P. Anderson, Jr. In press. Phy-
tologia. Harold N. Moldenke & Alma L. Moldenke, Plainfield, N.J.
07060. Use of picloram to obtain ROOTkill of unwanted woody
plants in practicable Rightofway Vegetation Management, 1982.

Egler, Frank E. and John P. Anderson, Jr. In press.
Phytologia. Plainfield, N.J. 07060. Use of picloram to obtain
ROOTkill of unwanted woody plants in practicable Rightofway
Vegetation Management, 1983.

Use of Picloram

to obtain ROOTkill of unwanted woody plants,
in Practicable Rightofway Vegetation Management, *1982.

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The full 32-page typescript of this Report is filed in the Library of Northwestern Connecticut Community College, Winsted, Ct. 06098.

SUMMARY

The purpose of this research was directly to investigate the effects of picloram (the triisopropanolamine salt of 4-amino-3,5,6-trichloropicolinic acid), when applied very selectively to individual trees and shrubs, in particular to effect rootkill, rather than merely topkill-with-subsequent-resprouting. The purpose was indirectly to use the above technique (1) in implementing our long-standing goal for R/W Vegetation Management at "the lowest costs, for the most years (life of line) with the highest environmental values--within the engineering needs": (2) to interpret the surviving plant-communities after the death of the unwanted woody plants, especially with respect to reinvansion by seedlings of unwanted woody plants; and (3) to interpret the additional practical values of these resultant plant-communities with respect to: screens at highway crossings, general scenic effects, public acceptance in the restricted use of herbicides, trails and access roads, and wildlife habitat of game and non-game species.

The material used was Dow's liquid Tordon, purchased in the open market. Tordon is a water-soluble mixture of 5.4% picloram and 20.9% of a comparable salt of 2,4-D. Because of past research, it would appear that picloram is the effective agent. Tordon was applied half-strength, mixed with water. Variations in personal applications are such that one can easily apply 2 or 3 times the "normal" amount to some stubs. Other spraying materials were: 1½ pint and 3½ pint plastic spray applicators, pruning shears, a folding saw, a pair of rubber gloves, and a small hatchet (for "cupping" and "frilling"). Ninety-seven species of trees and shrubs including a few undesirable herbs, were investigated directly. The species treated were those available in the experimental areas, remaining after years of chlorophenoxy and mechanical treatments, and those reinvading by seedlings and vegetative spread. Since (A)woody plants exist in every possible combination of numbers and sizes of

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main stems, and numbers and sizes of lateral branches, and of actual heights, and since (B) the study was directed towards the simplest, easiest and cheapest way to get rootkill, it was not intended to categorize the data for formal data-banking and ecologic manipulation. Only two groupings were established: (1) small stubs cut by a pruning shears, to 2 cm. in diameter; and (2) woody stems to 10 cm. in diameter, saw-cut. Cuts were made at all heights, from close to the ground (the most time-consuming), up to 1½ m. high. Cutting at breast height required the least time, especially where there was dense grass, or where the undesired trees emerged from dense and/or thorny shrubs. For branching trees, either one cut was made of the main stem, or several branches were cut at various sides and heights of the main stem. Larger tree saplings were "cupped", "frilled", or "saw-grated". When dealing with shrubs, from one, to several, to all main stems were treated (aiming to get the best rootkill in the shortest time). Vegetatively spreading clones (like beech and aspen) were watched for chemical effects traveling thru the roots to other untreated ramets.

All studies were made at Aton Forest, Norfolk, northwestern Connecticut, an 1100-acre privately owned research area, typical of beech-birch-hemlock forest widely distributed in northeastern North America and in the southern Appalachians, with analogues elsewhere in North America. All sites have been known to the major contractor since 1925, and have been the locus for intensive herbicide research since 1946. This 1982 study was carried out on eight separate tracts totally ca. 25 acres, one mile of roadside, and other small sites. Tordon pellets were first used in 1978, and liquid Tordon since 1980.

1982 data are a report of 45,570 applications made on 97 species of plants, both those "undesirable" on R/Ws, and those that are highly desirable and can be unintentionally rootkilled by indiscriminant spraying. About 2½ gallons of full-strength commercial Tordon (picloram) were used. The entire project, including field and office activities, totalled slightly over 350 hours.

*Picloram pellets are not recommended, because of unpredictable rootkill, unpredictable downwash in the soil solution and unpredictable pickup by the roots of nearby desirable plants.

*Picloram applied selectively to specific stubs of woody plants has proven, with few exceptions, to be a highly efficient root-killer, and a highly efficient preserver of adjacent desirable plants.

*The most sensitive species are Trembling Aspen, the birches, and the shrub Bristly Locust. With the aspen and the locust, adjacent ramets of the clone are affected, assuring kill of small untreated stems.

*The majority of woody species fall into the category of being "sensitive", especially if treatment is relatively close to the ground, and even if only a few branches of a main trunk or a few stems of a multistemmed clump are treated.

*Red Oak and White Ash (unfortunately accumulating from years of non-rootkilling treatments with 2,4,5-T) are relatively resistant. Treatments should be within 15 cm. of the ground.

*75% or more of the 45,570 stubs treated in 1982 were within 20 m. of the forest edges of the eight treated fields, almost entirely in areas not covered by plant-communities of shrubs and ferns. This phenomenon emphasizes the desirability of not destroying such stable vegetation at the sides of rightofways by indiscriminate blanket spraying.

*Conifers are in general not susceptible when stub-sprayed; but accidentally sprayed soil (noticeable when application is done with snow on the ground) may have toxin that is picked up, and lethal even to mature coniferous trees.

*That desirable shrubs may be root-killed, even when only a few stems are treated with picloram indicates the importance of recognition of these shrubs in the field by competent sprayers.

*The pruningshears-foldingsaw-squirtbottle method of applying picloram is extremely effective for removing and rootkilling unwanted single trees from dense and even thorny shrubs. Not only does the technique require minimal labor at a convenient height, but the remaining dense shrub is itself a "control" against both subsequent resprouting, and against reinvasion by new tree seedlings.

*Observations on "recovery" do not indicate that liquid picloram is "highly persistent" and "long-lasting". Shrubs in which pick-up from accidentally sprayed soil has distorted the foliage in the first year, often recover by the second or third year. And altho excessive runoff from treating low stubs may bare a small spot of soil for the first year (to 30 cm. dm.), grasses and mosses will cover the spot by the second year. These statements pertain only to the highly selective spot-treatments here applied.

*No field evidence indicates damage or destruction to any of the desirable remaining plant-communities, or to undesirable persistence of this herbicide in the local ecosystem.

*No field evidence indicates any increasing resistance on the part of individuals, or populations of a species, to this herbicide, as with insects becoming tolerant to DDT.

*It must not be forgotten that the primary objective of long-term, low-cost, high-environmental-value Vegetation Management of R/Ws is not only the rootkill of undesirable trees, but also the establishment of stable non-forest plant-communities which by "competition" and/or allelopathy tend to resist the reinvansion of trees -- like the two-centuries old ericaceous Balds and Slicks of the southern Appalachians.

*In conclusion the selective application of liquid picloram to stubs of unwanted trees and shrubs is a recommended procedure for "brush control" on transmission and distribution lines. The methodology requires minimal special training, has already been utilized by contracting companies, and is within the expertise of utility company foresters. The desired Vegetation Types occur naturally in nature, and have been developed at Aton Forest, by studies and research dating back to 1925.

NEW PHANEROGAM SPECIES FROM CHOCO, COLOMBIA

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Very many new species of flowering plants have been discovered in recent years in the course of our collaborative plant exploration program in the western Colombian Chocó. Here we describe four additional novelties belonging to four different families: Ampelocera macrocarpa Forero & Gentry (Ulmaceae), Pithecellobium longipendulum Forero & Gentry (Leguminosae), Neoptychocarpus chocoensis Gentry & Forero (Flacourtiaceae), and Jacaratia chocoensis Gentry & Forero (Caricaceae).

AMPELOCERA MACROCARPA Forero & A. Gentry, sp. nov.

Arbor 10-30 m alta. Folia oblongo-elliptica, acuminate, basi oblique inaequilateralia, plerumque 8-25 cm longa, 4-10 cm lata, integra, glabra. Fructus subglobosus, 1.8-2 cm diametro, minute puberulus.

Tree, 10-30 m tall, to 50 cm dbh., the branchlets terete, inconspicuously minutely puberulous to glabrate, drying dark with a reddish tint when young, becoming raised-lenticellate with age. Leaves 8-25 cm long, 4-10 cm wide (very narrowly oblong to an extreme of 30 X 5.3 cm in Nicaraguan sapling leaves), oblong-elliptic, entire, short-acuminate, the acumen 1-1.5 cm long, oblique and asymmetric at base, not obviously 3-nerved, the secondary veins strongly ascending, the tertiary venation more or

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less parallel, prominulous above and below, punctate-glandular below, otherwise glabrous on both surfaces, or occasionally with a few appressed trichomes on midvein when young, reported as having a dark blue color when young and not yet fully expanded; petiole rather thick, 0.2-1.2 cm long. Inflorescence (in Costa Rica) thick-branched, contracted-corymbose, less than 2 cm long, inconspicuously minutely puberulous. Flowers unknown. Fruit subglobose, 1.8-2 cm in diameter, minutely puberulous, yellow at maturity, the woody pericarp ca. 2-3 mm thick, single-seeded.

Type: COLOMBIA: Chocó: Upper Río Truandó between La Teresita and mouth of Río Ramón, 20 Jan 1974, Gentry 9436 (holotype, COL; isotype, MO).

Additional collections examined: COLOMBIA: Chocó: Trail from Río Tigre base camp up Serranía del Darién W of Unguía, 300-600 m, 17 Jul 1975, Gentry & L. E. Aguirre 15286A (COL, MO). COSTA RICA: Heredia: Finca La Selva, Puerto Viejo, Sarapiquí, 10°26'N, 84°1'W, 30 May 1974, Hartshorn 1495 (MO). NICARAGUA: Zelaya: Sur de Río Wawa, 60 km N.O. de Puerto Cabezas, 40 m alt., 83°56'W, 14°19'N, 13 Mar 1971, Little 25135 (MO), 16 Mar 1971, Little 25165 (MO); road from Siuna to El Dos ca. 1 km E of Cerro Livico, 400-600 m, 13°46'N, 84°47'W, 12 Dec 1980, Stevens 18687 (MO); comarca de San Isidro, Río Pajarito, 3 Oct. 1982, Angela Laguna 85 (MO).

N.v.: "rescaldo" (Costa Rica); "cuscano" (Nicaragua); "yayo" (Nicaragua).

Ampelocera is a rather nondescript and exceedingly poorly known genus. There are probably more specimens filed as familial "indets" in the world's herbaria than correctly identified. Although it can be locally fairly common, it is apparently rarely fertile and most collections are sterile. The new species described here is closest to A. latifolia Ducke of upper Amazonia (many specimens of which have been misidentified as A. ruizii Kl.). It differs most conspicuously from A. latifolia in its much larger, thicker-walled, less asymmetric fruit (ca. 1.5 x 1 cm in A. latifolia). The flowers of both species are unknown; of the rather numerous collections of A. macrocarpa cited above all but the type and the single Costa Rican collection are sterile.

PITHECELLOBIUM LONGIPENDULUM Forero & A. Gentry, sp. nov.

Arbor 6-8 m alta, ramulis teretibus, rufo pubescentibus. Folia pinnis 6-12 jugis; petiolo 2-3.5 cm longo, puberulo, eglanduloso, rachi 8-17 cm longo, inter pinnae glandula urceolata instructo, axibus pinnarum 2-10 cm longis, villosis, basi et infra 1-3 paribus distalibus foliolorum glandulis munitis; foliola 10-25 juga, ovato-lanceolata, 3-12 mm longa, 1.5-4 mm lata, inaequilatera, basi obtusa, apice acuta, supra costa media pubescentia, margine ciliata, subtus glabra vel glabrescentia. Capitula axillares, pendunculis 18-27 cm longis, pubescentibus. Flores sessiles, rosei; calyx 1.5-3 mm longus, breviter dentatus, apice pilis ornatus; corolla calycem triplo excedens, glabra, ca. 11 mm longa, lobis apice barbatis; tubus stamineus inclusus, staminibus numerosis, glabris; ovarium atque stylus glabratus. Fructus haud visus.

Tree 6-8 m tall; branchlets terete, ferruginous-pubescent, lenticellate. Leaves bipinnate, the pinnae 6-12 jugate; pulvinus not clearly differentiated, 0.3-0.5 cm long, puberulous; petiole 2-3.5 cm long, puberulous, eglandular; rachis 8-17 cm long, densely villous, with rachis glands below insertion of each pair of pinnae; pinnae 2-10 cm long, villous, with an urceolate gland near base and with more or less developed glands just below insertions of the 1-3 distal pairs of leaflets; leaflets 10-25 jugate, ovate-lanceolate, inequilateral (midrib excentric), the apex acute, the base obtuse, the margin ciliate, glabrous above except for the pubescent midrib, glabrous or glabrescent below except the sparsely pubescent midrib, venation reticulate. Inflorescence capitulate, dense, axillary, pendulous, the peduncles 18-27 cm long, puberulous, more densely so distally. Flowers pink, sessile, bracteolate, the calyx 1.5-3 mm long, the tube sparsely puberulous or glabrescent, the teeth short, densely puberulous; corolla up to 11 mm long (measured in bud), three times as long as the calyx, glabrous, the lobes apically barbate; stamen tube included, the stamens numerous, glabrous; ovary short stipitate, glabrous, the style 12 mm long, glabrous. Fruit not seen.

Type: COLOMBIA: Chocó: Río Mutatá, tributary of Río El Valle, between base of Alto del Buey and mouth of river, alt. 100-150 m, 7 Aug 1976, Gentry & Fallen 17284 (holotype, COL; isotype, MO).

Additional collection examined: COLOMBIA: Chocó: Bahia Solano, dense forest along Quebrada Jellita, alt. 50-100 m, 22 Feb 1939, Killip & García-Barriga 33566 (COL).

A very distinct species which can be easily recognized by the long-pedunculate, pendulous inflorescence to which the name refers. This species is known from the region of Bahia Solano in western Chocó. Both collections studied come from the same general area. Killip apparently recognized that his collection represented an undescribed species of what he recognized as the segregate genus Cojoba, but "filipes," the name he wrote on the label of the COL specimen, was never published and anyway cannot be used in Pithecellobium where it is predated by P. filipes Benth.

NEOPTYCHOCARPUS CHOCOENSIS A. Gentry & Forero, sp. nov.

Arbor dioecia parva usque ad 8 m alta. Folia oblongo-elliptica, acuminata, cuneata, glabra, punctata, 18-35 cm longa, 6-13 cm lata. Flores viriduli, sessiles, axillares, fasciculati, bracteolis 1-3 mm longis subtenti, calyce tubulare, 2-3 mm longo, 4-lobato; staminibus 8, quatuor longioribus, ovario glabro, ovoideo, stigmate 3-4-partito. Fructus subglobosus, rubrus, 1 cm latus, irregulariter dehiscens.

Small dioecious tree to 8 m tall, with myristicaceous branching, the branchlets more or less terete to obscurely 3-angled, glabrous. Leaves alternate, distichous, oblong-elliptic, acuminate, cuneate at base, chartaceous, glabrous, drying conspicuously dark brown or blackish, often with a slightly reddish tinge, somewhat inconspicuously serrate, pellucid-punctate, 18-35 cm long, 6-13 cm wide; petiole thick, not well differentiated, 0.3-1 cm long; stipules minute, suborbicular, coriaceous, ca. 1 mm long, early caducous leaving scar. Flowers greenish, sessile, fasciculate in the leaf axils or from the axils of fallen leaves, subtended by a calyx-like series of cupular ca. 1-4 mm long bracteoles and bracts. Calyx tube of male flowers 2-3 mm long with 4 narrow 1-2 mm long suberect lobes, densely hairy inside at mouth of tube and base of stamens, the stamens 8, 4 long and 4 shorter, the filaments of longer stamens ca. 1 mm long, the short thick anthers ca. 0.3-0.5 mm long; female flowers similar but the calyx tube ca. 2 mm across; ovary glabrous, irregularly ovoid, slightly 3-angled,

the style ca. 1 mm long, with short 3-4-fid stigma. Fruit subglobose, red, fleshy, tardily irregularly dehiscent, ca. 1 cm across before opening, 1.5 cm across after dehiscence; seeds few, ca. 2 or 3 per fruit, round or irregularly compressed, ca. 5 mm across.

Type: COLOMBIA: Chocó: Road (under construction) to Lloró (2 km S of Yuto) from km. 27 of Quibdó-Istmina road, alt. ca. 100 m, tropical pluvial forest, 5°30'N, 76°37'W, 15 Jun 1982, Gentry & J. Brand 36955 (holotype, COL; isotypes, MO, JAUM, to be distributed).

Locally very common in the Quibdó region of central Chocó with a density of three individuals per 1000 m² in a vegetational sample from that area (Evolutionary Biology 15: 1-84. 1982; as Symplocos?).

Additional collections examined: COLOMBIA: Chocó: Carretera (en construcción) Yuto-Lloró, 1 km de Yuto, alt. 70 m, 9 Sep 1976, Forero & Jaramillo 2724 (COL, MO); road S from Yuto to Lloró, pluvial forest, 100 m, 17 Aug 1976, Gentry & Fallen 17827 (COL, MO); Quibdó-Tutunendo road ca. 3 km W of Tutunendo, pluvial forest, 80-90 m alt., 17 Jan 1979, Gentry & Renteria 24317 (COL, MO), 5 Jan 1981, Gentry et al. 30093 (COL, MO), 7 Jan 1981, Gentry et al. 30283 (COL, MO). Antioquia: Munic. Anorí, Corregimiento Providencia, Buenos Aires, entre Dos Bocas y Anorí, alt. 400-900 m, 24-31 May 1973, Soejarto et al. 4066 (COL, MO). Valle: Bajo Calima, 10 km N of Buenaventura, alt. 50 m, 3°56'N, 77°8'W, Mazuera 59 (MO).

It is perhaps not surprising that this nondescript member of a generally nondescript family has remained unrecognized and undescribed despite being very common in parts of Chocó Department. It has constituted the bulk of the Chocó familial "indets" at MO for a number of years. Over the years one of us (AG) variously tried to identify it as Icacinaceae, Ilex (Aquifoliaceae), Securinea (Euphorbiaceae), and most recently Symplocos (Symplocaceae); showing the specimens to a number of knowledgeable botanists provided no leads either, although the notoriously grab-bag family Euphorbiaceae was suggested. In hindsight, it seems strange that we failed to consider the other half of that well-known field ecologist's maxim: "When in doubt, try Euphorbiaceae or Flacourtiaceae". The pellucid punctate leaves are especially suggestive of this alliance. Perhaps

the most serious obstacle to identification was caused by misinterpretation of the flowers, the bracteoles of which resemble a calyx while the four fused sepals suggest a sympetalous corolla.

Discovery of the type, with male flowers, confirms the identification as Neoptychocarpus. The Soejarto collection, also with male flowers, was subsequently discovered filed under Casearia with a determination by Sleumer as "Casearia cf. resinifera Spruce ex Eichl. not cited in Fl. Neotropica"; obviously Dr. Sleumer was puzzled by this plant as well.

The Chocó plant would key to N. killipii (Monachino) Buchheim of upper Amazonia in the Flora Neotropica Flacourtiaceae treatment on account of its relatively few, curved-ascending secondary veins. Its flowers are much smaller and the inflorescences denser than those of N. killipii or N. apodanthus (Kuhl.) Buchheim, the only other previously known species. Other differences include green rather than white flower color, slender filaments, and a smaller smooth-surfaced fruit.

JACARATIA CHOCOENSIS A. Gentry & Forero, sp. nov.

Arbor dioecia 6 m alta, sine spinis. Folia 4-5-foliolata, foliolis ellipticis, acuminatis, cuneatis, supra glabris, infra dense puberulis, petiolo 19-40 cm longo. Inflorescentia paniculata, laxa, pauciflora. Flores masculini virides, calyce cupulato, corollae lobis angustatis, 1 cm longo, staminibus exsertis. Flores feminini non visi. Fructus non visus.

Dioecious tree 6 m tall, with abundant latex, not spiny. Leaves palmately compound, 4-5-foliolate, the leaflets broadly elliptic, long acuminate, cuneate at base, 15-27 cm long, 7-13 cm wide, glabrous above, below densely minutely puberulous and the surface canescent; petiolules well-developed, 2-3 cm long, the petiole 19-40 cm long. Inflorescence a lax rather few-branched and few-flowered panicle from the axil of a fallen leaf, with a few more or less lepidote trichomes, otherwise glabrous. Male flowers green when fresh, the calyx bluntly 5-toothed, cupular, 1-1.5 mm long, the corolla with a narrow basal tube ca. 1.7 cm long and 1-1.5 mm wide and five narrow 1 cm long lobes, stamens exserted by 3 mm, the anthers 2 mm long, with a connective minutely extended beyond the anther. Female flowers

and fruit not seen.

Type: COLOMBIA: Chocó: Municipio de San José del Palmar, hoya del Río Torito (afluente del Río Hábita), Finca "Los Guaduales", 630-830 m, 5 Mar 1980, E. Forero, R. Jaramillo, J. Espina, & P. Palacios 6699 (holotype, COL; isotype, MO).

This plant is completely distinct from any of the previously known species of the genus. In Badillo's (Publ. Assoc. Prof., Maracay, Venez. 1971) monograph this species keys out with J. heptaphylla (Vell.) DC. of coastal Brazil on account of the exerted equal-length anthers and absence of spines. That species differs in such fundamental characters as much narrower glabrous sessile leaflets and contracted masculine inflorescences. Jacaratia chocoensis is reminiscent of sympatric J. spinosa (Aubl.) DC. in the similar striking whitish indument of the leaf undersurface but differs in lacking spines, the much larger differently shaped leaflets, and long well-differentiated petiolules.

One other Jacaratia from the Chocó region may be undescribed. This is a collection from near Santo Domingo de los Colorados, Pichincha Province, coastal Ecuador (Dodson et al. 8527 (MO)) which one of us (AG) originally determined as J. dolichaula (D. Smith) Woodson. The flowers are immature but the inflorescence seems much more open than typical for J. dolichaula, previously known only from Central America. The leaflets are somewhat broader and have longer petiolules than other material of that species but are of the same general form.

Harold N. Moldenke

CLERODENDRUM SPINOSUM f. *PARVIFOLIUM* Mold., f. nov.

Haec forma a forma typica speciei foliis sub anthesin parvioribus 4--7 cm. longis 1--2.5 cm. latis recedit.

This form differs from the typical form of the species in having its leaves during full anthesis much smaller, only 4--7 cm. long and 1--2.5 cm. wide.

The type of the form was collected by Eugenio de Js. Marcano [J. J. Jiménez 4493] at Las Mercedes, in Paternales Province, Dominican Republic, on March 31, 1961, and is deposited in the United States National Herbarium in Washington.. The collector describes the plant as a shrub, 1 m. tall.

PAEPALANTHUS PILOSUS var. *MICROCEPHALUS* Mold., var. nov.

Haec varietas a forma typica speciei capitulis floriferis 1--2 mm. latis differt.

This variety differs from the typical form of the species in its very much smaller flowering heads, these being only 1--2 mm. wide.

The variety is based on *Percy H. Gentle 3780* from an open pine ridge at Swasy Branch, Toledo District, Belize, collected on November 15, 1941, and deposited in the Lundell Herbarium at the University of Texas. It was previously confused with *P. lamarckii* Kunth.

SYNGONANTHUS DENSIFOLIUS var. *BRACHYPHYLLUS* Mold., var. nov.

Haec varietas a forma typica speciei foliis brevioribus latioribusque ca. 1 cm. longis 2--3 mm. latis recedit.

This variety differs from the typical form of the species in its shorter and broader basal leaves, which are only about 1 cm. long and 2--3 mm. wide.

The variety is based on *Sueli Matiko Sano 61* from Chapada dos Veadeiros, about 3 km. southwest of Acampamento and about 6 km. east of Alto Paraíso, Goiás, Brazil, collected on February 16, 1979, at 1500--1600 m. altitude, and deposited in the Britton Herbarium at the New York Botanical Garden.

NOMENCLATURAL NOTES ON ASTER (ASTERACEAE)-- II.
NEW COMBINATIONS AND SOME TRANSFERS.

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Nomenclatural changes and transfers suggested in the following are supported by information obtained from the examination of types and authentic specimens. Several years of intensive field experience and experimental work, as well as the study of many herbarium specimens, form the foundation for the underlying taxonomic decisions. I have concluded that certain new combinations, transfers and status changes are needed, and that some taxa unjustifiably have been submerged, i.e., some older names should be reinstated.

Explanatory comments are presented in the appropriate places. The sequence of taxa is that of my classification of the New World species of Aster (Jones, 1980a). I am using this opportunity to correct some errors within groups in that classification. My decision to number notes that primarily deal with nomenclatural changes (cf. Jones, 1984a) was prompted by the anticipation of additional publications of this kind.

Aster subg. Oxytripolium

A. lemmonii A. Gray, Synopt. Fl. N. Amer. 1(2): 199, 1884. TYPE: "s. Arizona, Huachuca Mountains," near Ft. Huachuca, 1882. Lemmon 2743 (LECTOTYPE, here designated: GH!; Lemmon 2742 (SYNTYPES: G!, P!); Lemmon 2747 (possible SYNTYPE: BM!); Santa Rita Mountains, Pringle 318 (SYNTYPE: GH!); Pringle s.n. (possible SYNTYPES: G!, P!).

The lectotype seems to be the only specimen marked by A. Gray with the above name. In my opinion, the plants are to be identified with A. potosinus A. Gray and, on the basis of priority, the name A. lemmonii is to be placed in synonymy under the following:

A. potosinus A. Gray, Proc. Amer. Acad. Arts 15: 32, 1880. TYPE: Mexico, San Luis Potosi, 22°N. Lat., 1878. Parry & Palmer 384 (HOLOTYPE: GH!; ISOTYPES: BM!, P!).

A. leonis Britton does not belong in this subgenus.-- see subg. Symphotrichum sect. Dumosi.

A. lepidopodus Robinson & Fernald probably does not belong in Aster (cf. Nesom, 1981). The species definitely does not belong in this subgenus.

A. riparius Kunth has been transferred to Machaeranthera (cf. Jones, 1983a).

A. bracei Britton in Small, Fl. Miami 190, 1913. TYPE: Bahamas, New Providence, 31 Aug, 1904. Britton & Brace 394 (HOLOTYPE: NY!).-- Syn.: A. tenuifolius L. var. aphyllus R. W. Long, Rhodora 72: 40, 1970. TYPE: Florida, Hillsborough Co., n.w. of Tampa, 24 Dec, 1962. Lakela 25610 (HOLOTYPE: GH!; ISOTYPE: USF!).

In my opinion, this taxon should be recognized at the rank of species.

Aster subg. Virgulus sect. Concolores

A. pratensis Rafinesque, Fl. Ludov. p. 67, 1817. Lasallea sericea (Vent.) E. Greene ssp. pratensis (Raf.) Semple & Brouillet, Amer. J. Bot. 67: 1022, 1980. Virgulus pratensis (Raf.) Reveal & Keener, Taxon 30: 649, 1981. TYPE: Louisiana, Robin (not found).

Although I have not seen the type of the above name, the plant and other specimens identified with it, in my opinion, are only varietally distinct from A. sericeus Vent. The name A. pratensis is placed in synonymy under the following:

A. sericeus var. β microphyllus De Candolle, Prodromus 5: 233 (no. 45), 1836. TYPE: Texas, Nov, Dec, 1828, Berlandier 1876 (HOLOTYPE: G-DC!; ISOTYPES: BM!, G!, P!).-- A. ciliatus Nuttall, Trans. Amer. Phil. Soc. n.s. 7: 295, 1840, non Walter (1788). TYPE: "In Louisiana, v.s., in Mr. Durand's herbarium, of Philadelphia." (HOLOTYPE: probably PH-- not seen).-- A. phyllolepis Torrey & Gray, Fl. N. Amer. 2: 113, 1841. Lasallea phyllolepis (Torr. & Gray) E. Greene, Leafl. Bot. Obs. & Crit. 1: 5, 1903. TYPE: the same as that of A. ciliatus Nuttall (LECTOTYPE, here designated: probably PH-- not seen); Texas, 1835. Drummond s.n. (SYNTYPES: BM!, CGE!, P!).

Aster subg. Virgulus sect. Patentes

A. lima Lindley in De Candolle, Prodromus 5: 230. 1836. TYPE: Mexico, Mr. Graham [HOLOTYPE: CGE! (ex Herb. Bentham)].

The taxon is conspecific with and the name goes in synonymy under the following:

A. moranensis Kunth, Nov. Gen. Sp. 4: 93, 1820. TYPE: Mexico, "inter Cerro Ventoso et sodinam Moran." Humboldt 4113 [HOLOTYPE (or LECTOTYPE, here designated): P!; ISOTYPE (or ISOLECTOTYPE): B!]. Synonyms: A. ehrenbergii Schultz-Bip. in Seemann, Bot. Voy. H. M. S. Herald, p. 302, 1856. TYPE: Mexico, Ehrenberg 791 (LECTOTYPE, here designated: P!; ISOLECTOTYPES: B?, CGE!; Ehrenberg 947 (SYNTYPES: B?, CGE!, P!)).-- A. lindenii Schultz-Bip. in Seemann, Bot. Voy. H. M. S. Herald, p. 302, 1856. TYPE: Mexico, Veracruz, "in savannis Miradoris," Jan, 1839. Linden 1170 (LECTOTYPE: P!; 2 ISOLECTOTYPES or SYNTYPES: G!).

Aster subg. Conyzopsis (Torrey & Gray) A. Gray

I may risk being accused of going contrary to my previously advocated generic concept of Aster but, if any groups are to be segregated, in my opinion, this should be one of them. Löve and Löve (1982) have recently reinstated the generic name Brachyactis for the group and, in this case, I agree with them (cf. Jones, 1984b). Although I have made only a cursory search of the literature, the available evidence suggests that the center of distribution for Brachyactis may be Asia, rather than North America (cf. Bentham & Hooker, 1873; J. D. Hooker, 1882; Kitamura, 1960, 1964; Tamamschjan, 1959). Several species have been described from Asia, although some apparently belong in Erigeron. At this time, I cannot make a judgment. However, I have seen an authentic specimen (CGE!) that probably is an isotype of the generic name, a Ledebour collection from Siberia originally named and described as Erigeron ciliatus. This plant is very robust, with an ample diffusely branched capitulescence, but otherwise nearly indistinguishable from specimens of North American collections that have been called A. brachyactis S. F. Blake (a renaming of the above under Aster because the name A. ciliatus was preoccupied).

The two species that occur in North America are only weakly distinguishable, but at this time, I will not combine them. The synonymies are listed below.

Brachyactis ciliata (Ledebour) Ledebour, Fl. Ross. 2: 495. 1846. Erigeron ciliatus Ledebour, Ic. pl. p. 24, 1829; Fl. Altaica 4: 92. 1829. Aster ciliatus B. Fedtschenko, Rastid. Turkest. p. 731, 1915, non Walter (1788). TYPE: Siberia. Ledebour s.n. (HOLOTYPE: not seen; probable ISOTYPE: CGE!).-- Conyza altaica De Candolle, Prodrromus 5: 380, 1836. TYPE: "in Siberia altaica" C. A. Meyer [SYNTYPE-- to be lectotypified (not seen)].-- A. brachyactis S. F. Blake, Contr. U. S. Nat. Herb. 25: 564, 1925, a renaming of B. ciliata (Ledeb.) Ledeb. under Aster, and based on the same type, i.e., Ledebour s.n.

Typical B. ciliata ssp. ciliata probably is restricted to Asia. Two subspecies can be recognized in North America, as follows:

- B. ciliata ssp. angusta (Lindley in Hooker) A. G. Jones, stat. and comb. nov. Tripolium angustum Lindley in Hooker, Fl. Bor.-am. 2: 15, 1834. Aster angustus (Lindley in Hooker) Torrey & Gray, Fl. N. Amer. 2: 162, 1841, non Nees (1818). B. angusta (Lindley in Hooker) Britton in Britton & Brown, Ill. Fl. 3: 383, 1898. TYPE: "Banks of the Saskatchewan", Drummond s.n. (not seen).-- Crinitaria humilis Hooker, Fl. Bor.-am. 2: 24, 1834. Linosyris? humilis (Hooker) Torrey & Gray, Fl. N. Amer. 2: 234, 1841. TYPE: "Banks of the Saskatchewan," Drummond s.n. (not seen).
- B. ciliata ssp. laurentiana (Fernald) A. G. Jones, stat. and comb. nov. Aster laurentianus Fernald, Rhodora 16: 59, pl. 109 f. 1-3, 1914. Brachyactis laurentiana (Fernald) Botschantzev, Not. Syst. Herb. Inst. Bot. Acad. Sci. URSS. 16: 384, 1954. TYPE: Prince Edward Island, Brackley Point, 31 Aug, 1912. Fernald, Long and St. John 8166 (HOLOTYPE: GH!; ISOTYPE: BM!, GH!).-- A. laurentianus var. magdalenensis Fernald, Rhodora 16: 59, pl. 109, f. 4, 1914. TYPE: Magdalen Islands, Coffin Island, Grande Entree, 19 Aug, 1912. Fernald, Long and St. John 8165 (HOLOTYPE: GH!; ISOTYPES: BM!, BH-CU!).-- A. laurentianus var. contiguus Fernald, Rhodora 16: 60, pl. 109, f. 5, 1914. TYPE: New Brunswick, Gloucester Co., Tracadie, S. F. Blake 5645 (HOLOTYPE: GH!; ISOTYPE: BH-CU!, P!).
- B. frondosa (Nuttall) A. Gray, Proc. Amer. Acad. Arts 8: 647, 1873. Tripolium frondosum Nuttall, Trans. Amer. Phil. Soc. n.s. 7: 296, 1840. Aster frondosus (Nuttall) Torrey & Gray, Fl. N. Amer. 2: 165, 1841. TYPE: Oregon, "Muddy ponds in the Rocky Mountains, near Lewis [Snake] River," Nuttall (HOLOTYPE: BM!).-- B. ciliata var. carnosula Benthham in Hooker's Icones Plantarum 12: 6, 1876. TYPE: New Mexico. (not seen).-- A. woodhousei Wooton, Bull. Torrey Bot. Club 25: 458, 1898. B. woodhousei (Wooton) Wooton & Standley, Contr. U. S. Nat. Herb. 19: 682, 1915. TYPE: New Mexico, Zuni, Sept, 1851. Woodhouse s.n. [LECTOTYPE, designated by Wooton & Standley, l.c. (not seen)]. E. New Mexico, Sept, 1853. Bigelow, and Albuquerque, 1894. C. L. Herrick (SYNTYPES: not seen).

Aster subg. Symphyotrichum sect. Concinni

- A. azureus Lindley in Hooker = A. oolentangiensis Riddell (cf. Jones, 1983b).
- A. purpuratus Nees: not to be identified with A. attenuatus Lindley in Hooker (see note below). Instead, to be recognized at varietal rank, as follows:

A. laevis L. var. purpuratus (Nees) A. G. Jones, stat. and comb. nov. A. purpuratus Nees, Gen. et sp. Ast. 118, 1832, pro parte (excl. coll. Horto Argentoratensi and Herb. Nestler); De Candolle, Prodrum 5: 244, 1836. TYPE: "hort. Par.", under the name A. miser (HOLOTYPE: Herb. Lamarck, P!).-- A. miser sensu Lamarck, Enc. Meth. 1: 308, 1783, non Linnaeus (1753), i.e., excl. synonyms. TYPE: as above.-- A. virgatus Elliott, Sketch Bot. S. Carolina and Georgia, p. 353, 1824, non Moench (1802). TYPE: "in the western district of Georgia", Elliott (not seen).-- A. ursinus Burgess in Small, Fl. S.E. United States, pp. 1218 and 1340, 1903. TYPE: Georgia, 1840?, Boykin s.n. (HOLOTYPE: NY!; ISOTYPE: GH!).

Shinners (1945: 68) pointed out that Aster purpuratus Nees is an "exempla incongrua," partly because of pubescence traits mentioned in the description that he regarded as uncharacteristic for a member of the A. laevis group. He discarded the name as "obviously based on a mixture," but he failed to cite the specimens or lectotypify the name. The only published reference given by Nees von Esenbeck (1832) is that of Lamarck (1783). De Candolle (1836), by excluding the Linnaean synonyms from consideration, actually determined that the name was to be based on the specimen from the "Jardin du Roi" in Lamarck's herbarium. Note that the holotype for A. laevis var. purpuratus is the LECTOTYPE (here designated) for the basionym, i.e., for A. purpuratus Nees sensu lato. The plant is perfectly described by A. virgatus Elliott.

A. attenuatus Lindley in Hooker, Comp. Bot. Mag. 1: 97, 1835.-- This name really seems to be based on two totally incongruous elements. The TYPE is cited as "Jacksonville, Louisiana, Drummond." A specimen in Lindley's herbarium at CGE(!) was marked as "type", probably by Dr. Yeo, and annotated by me as "probable HOLOTYPE or LECTOTYPE." However, the information on the sheet gives "Alabama" as the place of collection. The plant is somewhat intermediate in characteristics between A. dumosus and A. laevis. A second Drummond collection inscribed with Lindley's name is on deposit at GH (!). This specimen has the correct locality information for A. attenuatus, but the plant belongs in A. paludosus ssp. hemisphericus.

Aster subg. Symphyotrichum sect. Dumosi

A. brachypholis Small: to be combined with A. fragilis Willd. but recognized at the varietal level, as follows.

A. fragilis Willdenow var. brachypholis A. G. Jones, stat. and comb. nov. A. brachypholis Small, Man. S.E. Flora, pp. 1389 and 1509, 1933. TYPE: Florida, Liberty Co., Aspalaga Bluff, 28 Nov, 1923. Small, De Winkeler & Mosier 11027 (HOLOTYPE: NY!).

The plants are morphologically similar to those that have been called A. vimineus Lam. var. subdumosus Wieg. They seem to combine certain traits of A. dumosus L. and A. vimineus sensu auct. non Lam. (= A. fragilis). However, I am not combining the two varieties because I think they have originated independently, and they are geographically separated. In fact, the intermediate traits exhibited by the plants from n. Florida, s. Mississippi, s. Louisiana, and adjacent s.e. Texas that identify with A. fragilis var. brachypholis are almost certainly the products of introgression involving gene flow from southern varieties of A. dumosus, whereas the plants of var. subdumosus-- type locality: Olney, Illinois (see below)-- may be mere morphological variants (i.e., the heads long-peduncled, not secund) that have resulted from convergent evolution via adaptive radiation, and not from gene flow. Or, if the populations were influenced by gene flow from A. dumosus, the taxon involved probably would be var. strictior Torr. & Gray, a well delimited northern variety that ranges from the Great Lakes region eastward to the Atlantic (cf. Wiegand, 1928).

- A. fragilis Willd. var. subdumosus (Wiegand) A. G. Jones, comb. nov. A. vimineus Lam. var. subdumosus Wiegand, *Rhodora* 30: 171, 1928. TYPE: Illinois, Richland Co., Olney, 23 Sept, 1914. Ridgway 68 (HOLOTYPE: GH!).
- A. bullatus Klatt, *Ann. Naturhist. Mus. Vienna* 9: 359, 1894. TYPE: Mexico, Inquila, March, Galeotti s.n. (HOLOTYPE: W!).-- Syn.: A. jalapensis Fernald, *Proc. Amer. Acad.* 35: 572, 1900. TYPE: Mexico, Veracruz, Barranca de Chavarillo, 24 April, 1899. C. G. Pringle 8118 (HOLOTYPE: GH!; ISOTYPES: BM!, CM!, G!, M!, MO!, MSC!, P!, RM!).-- ?A. burgessii Britton, *Bull. Torrey Bot. Club* 41: 14, 1914. TYPE: Cuba, Prov. Pinar del Rio, Vicinity of Guane. "Falls, Rio Portales, March 4-5, 1911." N. L. Britton, E. G. Britton & J. F. Cowell 9751 (HOLOTYPE: NY!).-- A. schaffneri Schultz-Bip., nomen tantum?!. Authentic specimens: Mexico, Veracruz, Orizaba, Oct, 1855. Schaffner 371 (potential LECTOTYPE: P!); Schaffner s.n. (potential SYNTYPES: GH!, P!).

This species is very variable, probably closely related to A. lateriflorus. I had listed it at the end of my classification among the species unknown to me (Jones, 1980a), but in the meantime, the holotype was sent to me for study from Vienna. In addition to Mexico, collections have been recorded from Guatemala and also from Cuba (= A. burgessii).-- Note that A. jalapensis Fernald is placed in synonymy here.-- There are many herbarium specimens that have been labelled A. schaffneri Schultz-Bip., all collected in the state of Veracruz. I have been unable to find an effectively published reference to this name.

A. spatelliformis Burgess in Small = to be recognized at varietal rank as follows:

A. lateriflorus (L.) Britton var. spatelliformis (Burgess in Small) A. G. Jones, stat. and comb. nov. A. spatelliformis Burgess in Small, Fl. S.E. United States, pp. 1225 and 1340, 1903. TYPE: Florida, Duval Co., near Jacksonville, 1895. A. H. Curtiss s.n. (HOLOTYPE: NY!).

A. vimineus Lamarck = A. lateriflorus (L.) Britt.

I have examined and re-examined the type material in the Lamarck herbarium (P!). There are three pieces ("H. R."), one of which was marked TYPE (should be LECTOTYPE!). This specimen and a probable duplicate (= ISOLECTOTYPE) belong in typical A. lateriflorus. The third specimen, not in flower and to be regarded as a SYNTYPE, probably belongs in var. angustifolius Wiegand. The name that applies to A. vimineus s.auct. non Lam. is A. fragilis Willd. (cf. Jones, 1980a, b).

A. fontinalis Alexander in Small, Man. S.E. Flora, pp. 1382 and 1509, 1933. TYPE: Florida, prairie s. of Deep Lake, 7 Dec, 1925. Small & Buswell s.n. (HOLOTYPE: NY!).

This species belongs in subsect. Dumosi. In addition to the type, I have seen collections, probably belonging in this species, from n. Florida, s. Louisiana, and s.e. Texas. The species is closely related to and possibly to be submerged under the following (more study is needed):

A. leonis Britton, Mem. Torrey Bot. Club 16: 114, 1920. TYPE: Cuba, Prov. Havana, "marshes west of Batabano," 7 Dec, 1915. Leon & Cazanas 5753 (HOLOTYPE: NY!; ISOTYPE: P!).

Aster subg. Symphyotrichum sect. Heterophylli

A. ciliolatus Lindley in Hooker var. comatus (Fernald) A. G. Jones, comb. nov. A. lindleyanus Torrey & Gray var. comatus Fernald, Rhodora 6: 142, 1904.-- A. ciliolatus f. comatus (Fernald) Fernald, Rhodora 51: 95, 1949. TYPE: Maine, river thicket, Fort Fairfield, 19 Sept, 1900. Fernald, s.n. (HOLOTYPE: GH!; probable ISOTYPE: NEBC!).

This variety is characterized by a densely hirsute stem and by leaves that are uniformly hirsute on the lower surface.

A. ciliolatus var. wilsonii (Rydb.) A. G. Jones, stat. and comb. nov. A. wilsonii Rydberg, Bull. Torrey Bot. Club 37: 138, 1910. TYPE: British Columbia, Armstrong, 1904. E. Wilson 419 (HOLOTYPE: NY!; ISOTYPE: UBC!).

The plants are characterized by having the larger leaves with rounded, rather than cordate bases; petioles, midribs and upper portion of stems are ciliate pubescent with long white trichomes. Heads are relatively large, the ligulate corollas ca 12-15 mm long (incl. the tubes).

A. x maccallae Rydberg, pro sp.

After examining the holotype, as well as populations in the field, I have concluded that my previous interpretation (Jones, 1980a, b) is incorrect. The plant probably is not a true hybrid. Instead, it may be a derivative that essentially belongs in A. ciliolatus but exhibits strong introgression of A. laevis, as well as some influence of A. subspicatus Nees. Nomenclaturally, the plants are best accommodated at varietal rank as follows:

A. ciliolatus Lindley in Hooker var. maccallii (Rydberg) A. G. Jones, stat. and comb. nov. A. maccallae Rydberg, Bull. Torrey Bot. Club 37: 138, 1910. TYPE: Alberta, vicinity of Banff on Sulphur Mtn., 16 Aug, 1899. McCalla 2026 (HOLOTYPE: NY!; ISOTYPE: ALTA!).

A. texanus Burgess = to be merged with A. drummondii, as follows:

A. drummondii Lindley in Hooker ssp. texanus (Burgess) A. G. Jones, stat. and comb. nov. A. texanus Burgess in Small, Fl. S. E. United States, pp. 1214 and 1339, 1903. TYPE: "Tex., Lindheimer, 1842, (?) in Herb. Mo. B. G." (i.e., holotype said to be at MO, but not found); "Comanche Spring; New Braunfels, etc., Oct. 1849," Lindheimer 872 [LECTOTYPE (or NEOTYPE), here designated: NY!; ISOLECTOTYPES (or ISONEOTYPES): BM!, NY!, P!].

Although Lindheimer was in the Houston, Texas, area in 1842, I wonder whether there was not a mix-up in numbers (the type of A. vernalis Engelmann ex Burgess in Small, l.c., is an unnumbered Lindheimer collection made in March of 1842, and it is on deposit at MO!). The question mark in the type citation of A. texanus suggests that Small (1903: 1339) may have had some doubt. The specimens of Lindheimer 872, originally labelled A. drummondii, clearly belong in this species. Evidently Burgess did not mark a single specimen with the name A. texanus. There are two sheets at NY, the herbarium most likely to have the specimens seen by Burgess. I have chosen to typify the name with that sheet of Lindheimer 872 at NY which shows some pencilled diagnostic drawings and was annotated by Cronquist, in 1946, as A. texanus. The duplicate of that number at NY was sent there from MO by Blankinship, in 1907, i.e., after publication of the name.

- A. drummondii ssp. parviceps (Shinners) A. G. Jones, stat. and comb. nov. A. texanus var. parviceps Shinners, Field & Lab. 21: 156, 1953. TYPE: Texas, Bowie Co., Lewis Ferry, 8 mi N. of New Boston, 29 Sept, 1948. E. Whitehouse 20503 (HOLOTYPE: SMU!).

This taxon is not uncommon in Arkansas and Oklahoma, and also has been collected in Kansas. The plants are characterized by relatively small heads with white rays, a trait shared with plants of A. urophyllus Lindley in DC. The characteristic shared with typical A. drummondii is the uniform soft pubescence of stems and leaves. Habit of the capitulescence and the slightly pubescent achenes seem to link these plants with the ssp. texanus.

Aster subg. Symphyotrichum sect. Occidentales

Recent studies of the western species of the Aster occidentalis group (Allen et al., 1983; Dean & Chambers, 1983) suggest that a more natural classification is attained with the following change in status:

- A. sect. Salicifolii Torrey & Gray subsect. Occidentales (Rydberg) A. G. Jones, stat. and comb. nov. A. [sp.-group] Occidentales Rydberg, Fl. Colorado, p. 352, 353, 1906; Fl. Rocky Mountains p. 879, 881, 1917. TYPE: Rocky Mountains, Nuttall (LECTOTYPE: PH!; ISOLECTOTYPES: BM!, GH!), i.e., the type of Tripolium occidentale Nuttall = A. occidentalis (Nuttall) Torrey & Gray.

Aster subg. Symphyotrichum sect. Porteriani

- A. parviceps (Burgess) Mack. & Bush = to be merged with A. pilosus, as follows:

- A. pilosus Willd. ssp. parviceps (Burgess) A. G. Jones, stat. and comb. nov. A. ericoides L. var. parviceps Burgess in Britton & Brown, Ill. Fl. N. Amer. 3: 379, 1898. A. parviceps (Burgess) Mackenzie & Bush, Man. Fl. Jackson Co., Missouri, p. 196, 1902. A. depauperatus (Porter) Fernald var. parviceps (Burgess) Fernald, Rhodora 10: 94, 1908. TYPE: not designated and no authentic specimen found. NEOTYPE, here designated: Illinois, Cook Co., Englewood, 19 Sept, 1879. E. J. Hill 142/1879 (ILL!).

If A. pringlei (A. Gray) Britton is to be merged with A. pilosus (cf. Blake, 1930; Cronquist, 1952; Semple, 1978), then A. parviceps cannot be upheld as a separate species. I chose the Hill specimen as the neotype because the collection was made before the publication date of the basionym, and there is a good chance that Burgess may have seen a duplicate

of this sheet. The specimen was originally labelled A. ericoides and the varietal name "parviceps" was inked in, though at a later date, by the collector. The specimen well represents this taxon.

A. depauperatus (Porter) Fernald = an ecological variant of A. pilosus ssp. parviceps (cf. Fernald, 1808, 1809) and to be placed in synonymy, as follows:

A. pilosus Willd. ssp. parviceps (Burgess) A. G. Jones var. pusillus (A. Gray) A. G. Jones, comb. nov. A. ericoides L. var. pusillus A. Gray, Synopt. Fl. N. Amer. 1(2): 184, 1884. A. parviceps (Burgess) Mack. & Bush var. pusillus Fernald in Robinson & Fernald, Rhodora 11: 59, 1909. TYPE: "Serpentine barrens," Pennsylvania, Lancaster. T. C. Porter s.n. (probable HOLOTYPE: GH!).-- A. ericoides var. depauperatus Porter, Mem. Torrey Bot. Club 5: 323, 1894. A. depauperatus (Porter) Fernald, Rhodora 10: 94, 1908. TYPE: the same as that of var. pusillus (GH!).

Porter (1894) misinterpreted the rules of nomenclature. He published the superfluous varietal name "depauperatus" thinking that the epithet "pusillus" was preoccupied by the previously published specific name A. pusillus Hornemann.

Aster subg. Symphyotrichum sect. Salicifolii

A. lanceolatus Willd.

This species belongs in subsect. Leucanthi. Having examined numerous herbarium specimens, and having been frustrated by the high incidence of intergradation, I have come to agree with Semple (1979) and Semple and Brammall (1982) that A. simplex Willd. cannot be upheld as a separate species and must be merged with the above. However, since the types are distinct (cf. Jones and Hieppo, 1981) and, in their morphological extremes, the taxa have well defined geographic ranges, they should be recognized at the subspecies level. For similar reasons, I have reinterpreted A. interior Wiegand. This taxon almost certainly is not a true hybrid (cf. Jones, 1980a, b) but a fixed derivative that seems to be maintained by sexual reproduction generation after generation. In the field, the populations usually can be readily recognized, but again, there is a high incidence of intergradation with both A. simplex and A. lanceolatus s.str. in areas of sympatry. I am recognizing the taxon as a subspecies of A. lanceolatus. As this study has not been completed, I am not giving the entire synonymy at this time. A. lanceolatus ssp. lanceolatus is the taxon treated by Cronquist (1952) as A. simplex var. ramosissimus (Torr. & Gray) Cronq. (basionym: A. tenuifolius Torr. & Gray non L.

var. ramosissimus Torr. & Gray; synonym: A. paniculatus Lamarck non Miller]. The new combinations are as follows:

A. lanceolatus Willd. ssp. interior (Wiegand) A. G. Jones, stat. and comb. nov. A. interior Wiegand, Rhodora 35: 35, 1933. A. simplex Willd. var. interior (Wieg.) Cronquist, in Gleason, New Britt. & Brown Ill. Fl. 3: 466, 1952. TYPE: Illinois, [Fulton Co.], Canton, 1893. J. Wolf s.n. [HOLOTYPE: GH!; possible ISOTYPE (no. 39): GH!].-- Syn.: A. tradescantii s.auct. non L. (see below).

A. lanceolatus Willd. ssp. simplex (Willd.) A. G. Jones, stat. and comb. nov. A. simplex Willdenow, Enum. hort. Berol. 2: 887, 1809. TYPE: "Hort. bot. Berol.", Herb. Willdenow [LECTOTYPE (sheet 1): B!; ISOLECTOTYPES (sheets 2 and 3): B! (cf. Jones and Hiepko, 1981)].

A. tradescantii L. = A. lateriflorus (L.) Britton cf. var. hirsuticaulis (Lindley) Porter [Synonyms: A. lateriflorus var. tenuipes Wiegand.-- A. acadiensis Shinnery].

I have examined and re-examined the type in the Hortus Cliffortianus (BM! = LECTOTYPE, here designated). The specimen is very poor but floral characteristics place the plant in sect. Dumosi. There may be a slight degree of introgression of A. lanceolatus, similar to that evident in the type of A. vimineus Lam. var. saxatilis Fernald and in other collections that have been identified as A. saxatilis (Fern.) Blanchard. The latter are, in my opinion, either hybrids or hybrid derivatives involving A. lateriflorus and A. lanceolatus.

A. praealtus Poir. var. coerulescens (DC.) A. G. Jones, comb nov. A. coerulescens De Candolle, Prodrum 5: 235, 1836. A. salicifolius Lam. var. caerulescens (DC.) A. Gray, Synopt. Fl. N. Amer. 1(2): 188, 1884. TYPE: "Comancheros oriental du Texas," 1828, Berlandier 510 (= 1885) (HOLOTYPE: G-DC!; ISOTYPES: B!, BM!, G!, G-DC!, GH!, K!, MO!, P!).-- A. praealtus Poir. var. texicola Wiegand, Rhodora 35: 25, 1933. TYPE: Texas, Comanche Springs, 1849. Lindheimer 881 (HOLOTYPE: GH!; ISOTYPE: MO!).

Having carefully examined the substantial but rather poorly preserved type material, I agree with Shinnery (1949) that A. coerulescens belongs in synonymy under A. praealtus. I had previously interpreted this taxon as a hybrid between A. praealtus and A. simplex = A. lanceolatus. Putative hybrids, i.e., plants that exhibit intermediacy between the two above species, are not uncommon in the region of the type locality. They are probably to be identified with A. eulae Shinnery.

- A. puniceus L. ssp. elliottii (Torr. & Gray) A. G. Jones, stat. and comb. nov. A. elliottii Torrey & Gray, Fl. N. Amer. 2: 140, 1841. TYPE: South Carolina, Santee Canal, H. W. Ravenel (ex Herb. Elliott) (HOLOTYPE: GH!).

Although the extreme forms of this taxon can be distinguished from typical A. puniceus, there is complete intergradation in regions of sympatry, e.g., in Maryland, Virginia, and Tennessee. A diploid chromosome number of $n = 8$ is shared by populations of ssp. puniceus and ssp. elliottii (cf. Jones, 1980a, b).

- A. puniceus L. ssp. elliottii (Torr. & Gray) A. G. Jones var. scabrimaculis (Shinners) A. G. Jones, stat. and comb. nov. A. scabrimaculis Shinners, Field & Lab 21: 156, 1953. TYPE: Texas, Smith Co., 16 miles NW of Tyler, 19 Oct, 1947. Shinners 9504 (HOLOTYPE: SMU!).

Aster scabrimaculis Shinners is known only from Smith and Van Zandt counties, Texas, the tall-stemmed plants growing in boggy ground. The affinities clearly lie with A. puniceus. Characteristics of the leaves, rhizomes, and capituli relate the taxon to ssp. elliottii. In addition to their stout habit, the plants are distinguished by slender, long-attenuate, strongly squarrose phyllaries. A population from Smith County was found to have a diploid chromosome number of $2n = 16$ [leg. E. Nixon; voucher: A.G.J. 6728 (ILL)], a number shared with populations of typical A. puniceus, as well as ssp. elliottii.

- A. puniceus L. ssp. firmus (Nees) A. G. Jones, stat. and comb. nov. A. firmus Nees, Syn. Ast. 25: 1818. TYPE: "...Horto bot. Herbipolitano..." (not found; authentic specimen = LECTOTYPE: GH!).-- A. puniceus L. var. lucidulus A. Gray, Synopt. Fl. N. Amer. 1(2): 195, 1884. A. lucidulus (A. Gray) Wiegand, Rhodora 26: 4, 1924. TYPE: Wisconsin, Milwaukee, Lapham s.n. (HOLOTYPE: GH!; ISOTYPE: WIS!).

I had previously recognized this taxon at species rank. However, the high incidence of intergradation with typical A. puniceus and with other variants of this extremely variable species makes this specific separation untenable. The plants seem to exhibit some introgression of A. lanceolatus Willd. and/or A. longifolius Lam. This is also reflected in the reported chromosome counts (Jones, 1980b) which are both diploid and tetraploid ($2n = 16$ and 32). At this time, I am not citing the complete synonymy.

- A. novi-belgii L. ssp. johannensis (Fernald) A. G. Jones, stat. and comb. nov. A. johannensis Fernald, Rhodora 17: 12, 1915. TYPE: Quebec, near Ouatchouan Falls, Lake St. John. 19 Aug, 1904. W. F. Wight 228 (HOLOTYPE: GH!).-- A. longifolius

s.auct. non Lamarck.-- A. rolandii Shinnery, Rhodora 45: 347, 1943. TYPE: Nova Scotia, Inverness Co., Troy, 26 Sept, 1928. Prince & Atwood 1456 (HOLOTYPE: WIS!; ISOTYPE: GH!).-- A. longifolius Lam. var. villicaulis A. Gray, Synopt. Fl. N. Amer. 1(2): 189, 1884. A. novi-belgii L. var. villicaulis (A. Gray) Boivin, Nat. Canad. 94: 645, 1967. TYPE: northern Maine, [Aroostook Co.] Fort Kent, Aug, 1868? Kate Furbish s.n. (HOLOTYPE: GH!).

The plants are of somewhat shorter stature than typical A. novi-belgii. Introgression of A. ciliolatus or A. lateriflorus is suggested by the often pubescent midribs. Plants with uniformly villous stems are very common and are recognized as var. villicaulis (A. Gray) Boivin. While the stands of subsp. johannensis usually can be recognized in the field, identification of herbarium material is often difficult. One finds many specimens that are intermediate in characteristics. Populations of this subspecies [e.g., A.G.J. 4318, 4320, 4330, 5176 (ILL)] and of ssp. novi-belgii [e.g., A.G.J. 4287, 4298, 4313, 5162 (ILL)] share a hexaploid chromosome number of $2n = 6x = 48$, and my crossing attempts resulted in normal seed set.

A. novi-belgii L. ssp. tardiflorus (L.) A. G. Jones, stat. and comb. nov. A. tardiflorus Linnaeus, Sp. Pl., Ed. 2, 2: 1231, 1763. TYPE: cult. in Hort. Ups. Herb. Linn. no. 997.48 (LECTOTYPE, designated by me in 1981: LINN!); nos. 997.49 and 997.50 (ISOLECTOTYPES: LINN!).-- A. foliaceus s.auct. non Lindley in DC.-- A. subspicatus s.auct. non Nees.

In my experience, there is complete interfertility and a high degree of intergradation in areas of sympatry between populations of this subspecies and the other subspecies of A. novi-belgii. Chromosome numbers recorded are also the same: $2n = 48$ (cf. Jones, 1980b). The complete synonymy will be published elsewhere.

Aster subg. Aster sect. Alpigeni

A. alpinus L.

In my experience, all New World collections labelled A. alpinus, perhaps with one or two exceptions, belong in other taxa. I am not sure about the exceptions either because I did not have any mature achenes. In all probability, this species is not native in North America, but more study is needed. Aster pygmaeus Lindley in Hooker does not belong in this section but in sect. Radulini. The taxon is to be recognized as A. sibiricus L. ssp. pygmaeus (Lindley in Hooker) Löve & Löve.

Aster subg. Aster sect. SpectabilesA. carnerosanus S. Watson

So far, I have been unable to locate the type, but the species probably belongs near A. laevis (subg. Symphyotrichum sect. Concinni).

A. curtisii Torrey & Gray = A. retroflexus Lindley in DC. (sect. Concinni-- cf. Jones, 1983b).Aster subg. Aster sect. BiotiaA. mirabilis Torrey & Gray, Fl. N. Amer. 2: 165, 1841. TYPE: South Carolina, near Columbia, Sept, 1835. Gibbes (HOLOTYPE: GH!).--
A. commixtus s.auct. non Eurybia commixta Nees.

The specimen cited by Nees von Esenbeck (1832) for Eurybia commixta came from a plant cultivated in the Bonn Botanic Garden that possibly was of hybrid origin. I have seen an authentic specimen (G-DC!), which does not resemble the plants I have collected near Columbia, South Carolina. For one, it has heads with a somewhat glandular involucre of phyllaries that are not squarrose. Plants of A. mirabilis have eglandular, strongly squarrose phyllaries. In my opinion, the latter name should be reinstated for this Biotian species of South Carolina and Georgia.

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REFERENCES

- Allen, G. A., M. L. Dean and K. L. Chambers. 1983. Hybridization studies in the Aster occidentalis (Asteraceae) polyploid complex of western North America. Brittonia 35: 353-361.
- Bentham, G. and J. D. Hooker. 1873. Genera plantarum, Vol. 2. L. Reeve and Company, London.
- Blake, S. F. 1930. The names Aster ericoides and A. multiflorus. Rhodora 32: 136-140.

- Candolle, A. P. de. 1836. *Prodromus systematis naturalis, etc.*, Vol. 5. Treuttel and Wuerztz, Paris. (Aster: pp. 241-253).
- Cronquist, A. 1952. *Compositae*. In: Gleason, H. A., *The new Britton and Brown illustrated flora of the northeastern United States and Canada*. Vol. 3. Lancaster Press, Lancaster, PA.
- Dean, M. L. and K. L. Chambers. 1983. Chromosome numbers and evolutionary patterns in the Aster occidentalis (Asteraceae) polyploid complex of western North America. *Brittonia* 35: 189-196.
- Fernald, M. L. 1908. Notes on some plants of northeastern America. *Rhodora* 10: 46-55, 84-95.
- _____. 1909. In: Robinson, B. L. and M. L. Fernald. *Emendations of the seventh edition of Gray's Manual*.--I. *Rhodora* 11: 33-61.
- Hooker, J. D. 1881 [1882]. *The flora of British India*. Vol. 3. L. Reeve and Company, London.
- Jones, A. G. 1980a. A classification of the New World species of Aster (Asteraceae). *Brittonia* 32: 230-239.
- _____. 1980b. Data on chromosome numbers in Aster (Asteraceae), with comments on the status and relationships of certain North American species. *Brittonia* 32: 240-261.
- _____. 1983a. Nomenclatural transfer from Aster to Machaeranthera. *Syst. Bot.* 8: 85.
- _____. 1983b. Nomenclatural changes in Aster (Asteraceae). *Bull. Torrey Bot. Club* 110: 39-42.
- _____. 1984a. Nomenclatural notes on Aster (Asteraceae)-- I. The status of A. sandwicensis. *Brittonia* (in press).
- _____. 1984b. Chromosomal features as generic criteria in the Astereae. In: Lane, M. L. and B. L. Turner, editors. *The generic concept in the Compositae: a symposium*. *Taxon* (in press).
- _____. and P. Hiepko. 1981. The genus Aster s.l. (Asteraceae) in the Willdenow Herbarium at Berlin. *Willdenowia* 11: 343-360.
- Kitamura, S. 1960. *Flora of Afghanistan*. Comm. Kyoto Univ. Sci. Exped. Karakoram and Hindukush, 1955. Vol. 2.

- _____. Editor. 1964. Plants of West Pakistan and Afghanistan. Comm. Kyoto Univ. Sci. Exped. Karakoram and Hindukush, 1955. Vol. 3.
- Lamarck, J. B. A. P. M. 1783. Encyclopédie methodique. Botanique. Vol. 1. Panckoucke, Paris.
- Löve, A. and D. Löve. 1982. In: IOPB chromosome number reports LXXV, A. Love, editor. Taxon 31: 344-368.
- Nees von Esenbeck, C. G. 1832. Genera et species Asterearum. I. D. Grueson, Breslau.
- Nesom, G. L. 1981. A. new species and new combination of Mexican Erigeron (Compositae). Sida 9: 29-33.
- Porter, T. C. 1894. Aster, in: List of pteridophyta and spermatophyta growing without cultivation in northeastern North America. Mem. Torrey Bot. Club 5: 322-327.
- Semple, J. C. 1978. The cytogeography of Aster pilosus (Compositae): Ontario and the adjacent United States. Can. J. Bot. 56: 1274-1279.
- _____. 1979. The cytogeography of Aster lanceolatus Willd. (synonyms: A. simplex Willd. and A. paniculatus Lam.) in Ontario with additional counts from populations in the United States. Can. J. Bot. 57: 397-402.
- _____. and R. A. Brammall. 1982. Wild Aster lanceolatus x lateriflorus hybrids in Ontario and comments on the origin of A. ontarionis (Compositae - Astereae). Can. J. Bot. 60: 1895-1906.
- Shinners, L. H. 1945. The genus Aster in West Virginia. Castanea: 10: 61-74.
- _____. 1949. Aster coerulescens the same as A. praealtus. Rhodora 51: 91-92.
- Small, J. K. 1903. Flora of the southeastern United States. Publ. by the author. New York.
- Tamamschjan, O. 1959. Astereae. In: Flora U.R.S.S. Vol. 25, pp. 24-290. Bot. Inst. Acad. Sci. U.R.S.S. (publ. by V. L. Komarov), Leningrad.
- Wiegand, K. M. 1928. Aster lateriflorus and some of its relatives. Rhodora 30: 161-179.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXXII.

NEW SPECIES OF *WEDELIA* FROM BRASIL.

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Wedelia is one of the genera of the Asteraceae in Brasil most resistant to proper identification. This is partly because of the inadequate knowledge of the species that have previously been described, but it is also because of the large number of totally undescribed species. The present paper attempts partial solution of both problems. Notes are provided here regarding some of the previously described species and eleven new species are described. Concepts depend on some type fragments, type photographs, and some information from the literature.

Baker (1884) recognized that *Wedelia scandens* DC. was a synonym of *W. subvelutina* DC. A type photograph seen under the name *W. elliptica* DC. is the same plant in the type photograph of *W. vauthieri* DC. The former name never seems to have been published. *Wedelia goyazensis* Gardn. appears to be most closely related to *Zexmenia apensis* (Chod.) Hassler. *Wedelia pallida* Gardn. seems to belong in the synonymy of *W. trichostephia* DC. rather than the synonymy of *W. macrodonta* DC. where it was placed by Baker (1884). The latter appears to be the same as *Aspilia reflexa* Sch.Bip. ex Baker. If the identity is confirmed, and the generic concepts are maintained, a new combination will be necessary. Four recent collections from the vicinity of Crystallina in Goias, King 8257, 8935, 8947, 8970, show a range of variation that suggests *Wedelia oligocephala* Baker and *W. linearifolia* Baker are the same species. The name *W. oligocephala* is retained here, being more appropriate for the combined concept. Collections of *W. kerrii* N.E.Brown, including Hatschbach 46143, indicate a plant similar to *W. subvelutina* DC. in the elongated receptacles and exerted paleae of the aging heads. On the basis of a type photograph, *W. psammophila* Poepp. & Endl. is an *Eclipta*.

The new species are as follows.

WEDELIA ALMEDAE H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ca. 0.5 m altae mediocriter ramosae. Caule brunnescentes teretes dense strigoso-pilosi. Folia opposita, petiolis brevibus ca. 2 mm longis; laminae oblongo-ellipticae plerumque 2.0-4.5 cm longae et 0.4-1.3 cm latae base breviter cuneatae vel leniter rotundatae margine supra basem crenato-serratae apice subacutae vel obtusae supra antrorse strigosae subtus in nervulis reticulatis hispid-

ulo-strigosae utrinque glandulo-punctatis subtus densiores, nervis subpinnatis, nervis secundariis in quartis inferioribus valdioribus et ascendentiis. Inflorescentiae in ramis terminales unicapitatae vel dichasiiformes vel subthyrsoidae, pedunculis 0.4-3.0 cm longis dense strigoso-pilosi. Capitula late campanulata 7-9 mm alta; squamae involucri ca. 12 aliquantum regulariter biseriatae herbaceae oblongae 6-7 mm longae et 2.5-3.5 mm latae base distincte gibbosae vel protuberantes margine integrae apice obtusae et interdum breviter reflexae extus et distaliter intus strigoso-pilosulae et minute glandulo-punctatae; paleae oblongae vel oblanceolatae distaliter triangulares acutae margine superne puberulo-fimbriatae extus superne puberulae et minute glandulo-punctatae. Flores radii ca. 12 in capitulo; corollae flavae, tubis brevibus ca. 1 mm longis dense puberulis et in superficiis interioribus usque ad sinibus dense scabrido-setuliferis, limbis oblongis ca. 9 mm longis et 3.5 mm latis apice bilobatis extus dense glandulo-punctatis in nervis sparse puberulis et minute scabridulis. Flores disci ca. 40 in capitulo; corollae flavae 5.0-5.5 mm longae; tubis 1.5-1.8 mm longis glabris, faucibus 2.8-3.0 mm longis cylindraceis base campanulatis extus glabris, lobis triangularibus ca. 0.9 mm longis et 0.6 mm latis extus plerumque superne glandulo-punctatis in sinibus fasciculato-puberulis et paucae scabrido-setuliferis intus margine et superne breviter distincte papillois; filamenta in partibus superioribus ca. 0.3 mm longa mediocriter incrassata; thecae antherarum ca. 2 mm longae; appendices antherarum ovatae ca. 0.55 mm longae et 0.33 mm latae extus glanduliferae; rami stylorum anguste lineares non glanduliferi solum distaliter puberuli apice attenuate penicillati. Achaenia leniter complanata vel triquetra late obpyramidata ca. 3.5 mm longa et 2 mm lata base late rotundata minute puberula superne densiora apice valde constricta in coronis ca. 0.3 mm longis irregulariter dentata setulifera et setulo-fimbriata non aristata. Grana pollinis in diametro 25-27 μ m.

TYPE: BRASIL: Goias: 27 km S of Alto Paraíso. Disturbed cerrado vegetation at 2900 ft. elevation. Shrub 0.5 m tall. Florets yellow; anthers black. Jan. 25, 1980. *R. M. King & F. Almeda 8300* (Holotype, UB; isotype, US).

Wedelia almedae seems closely related to *W. regis*, described below, but differs by the less strongly differentiated trinervation, the rather regularly gibbous or even pointed projections on the bases of the involucre bracts, the corolla lobes of the disk flowers not being papillose to the base, and the more densely setuliferous surfaces near the apical sinuses of the ray corollas.

WEDELIA BAHIENSIS H. Robinson, sp. nov.

Plantae fruticosae ad 1 m altae mediocriter ramosae. Caules brunnescentes teretes striati dense hirsuto-strigosi et hispiduli superne dense strigosi. Folia opposita, petiolis 2-7 mm

longis; laminae ovatae 1.2-10.0 cm longae 0.7-5.0 cm latae base rotundatae et ad medio breviter acuminatae margine serratae vel superne subtiliter serrulatae apice breviter acutae in nervis secundariis fere ad basem distincte trinervatae vel valdius ascendentes supra strigosae et strigulosae subtus leniter pallidius plerumque in nervis et nervulis majoribus strigosae aliter minute sparse puberulae in nervis non exsculptae. Inflorescentiae terminales in ramis brevibus unicapitatae, pedunculis 1-13 cm longis dense strigosae. Capitula in involucris ca. 10 mm alta et 12 mm lata; squamae involucris ca. 8 (raro ad 10) late oblongae 9-20 mm longae et 6-7 mm latae exteriores plerumque herbaceae virides apice breviter vel longe acutae extus et margine dense strigosae perminute puberulae interiores scariosiores apice rotundatae margine dense ciliato-fimbriatae extus dense perminute scabrido-puberulae; paleae squamis involucris interioribus similes angustiores leniter obtusae. Flores radii ca. 8 raro ad 10 in capitulo; corollae flavae, tubis anguste cylindraceis ca. 2.5 mm longis glabris vel apice subsinosis pauca setuliferis, limbis oblongis ca. 15 mm longis et 8 mm latis apice bilobatis subtus sparse minute puberulis in nervis scabridulis, ramis stylorum apice longe anguste appendiculatis. Flores disci ca. 30-35 in capitulo; corollae flavae 6.5-7.0 mm longae, tubis 2.0-2.2 mm longis glabris, faucibus leniter infundibularibus base leniter campanulatis 3.0-3.3 mm longis glabris in nervis leniter fibrillosis, lobis triangularibus ca. 1 mm longis et 0.8 mm latis extus dense scabridulis non glanduliferis intus margine longe fimbriate papillosis; filamenta in partibus superioribus ca. 0.35 mm longa non distincte incrassata; thecae antherarum ca. 2.5 mm longae; appendices antherarum flavae ovatae 0.7 mm longae et 0.45 mm latae extus glanduliferae; rami stylorum longe lineares extus non glanduliferi tertiis basilaribus exceptis distincte puberuli apice longe anguste appendiculatis. Achaenia leniter complanata vel triquetra obpyramidata submatura ca. 4 mm longa plerumque sericeo-setulifera apice valde constricta in coronis ca. 0.5 mm longis irregulariter denticulata, coronis pappi extus glabris margine dense setulo-fimbriatis non aristata. Grana pollinis in diametro ca. 30 μ m.

TYPE: BRASIL: Bahia: 14 km along road W from Seabra, toward Ibotirama. Elev. 2900 feet. Shrub one meter tall, flowers yellow. Feb. 3, 1981. R. M. King & L. E. Bishop 8782 (Holotype, UB; isotype US). PARATYPES: BRASIL: Bahia: Locality as in holotype. Subshrub 1/2 meter tall, flowers yellow, may be a juvenile form of 8782. Feb. 3, 1981. R. M. King & L. E. Bishop 8781 (US); Bahia: Rod. BR-242, 15 km O de Seabra. Arbusto delgado, capítulos amarelos. Da Chapada. 12/10/1981. Hatschbach 44185 (US).

The new species is related to the small group of truly typical members of the genus in eastern Brasil including *Wedelia alagoensis* Baker, *W. hookeriana* Gardn. and *W. villosa* Gardn. and one specimen was chemically reported under the name *W. hookeri-*

ana (Bohlmann et al., 1982). The new species differs from the others by heads being strictly solitary in dichotomies without adjacent axillary heads and there are no large glands covering the undersurfaces of the leaves and outer surfaces of the involucre bracts. *Wedelia hookeriana* and *W. villosa* differ further by the longer slender pubescence on the leaf undersurfaces, and *W. alagoensis* differs by the shorter outer involucre bracts.

WEDELIA BISHOPII H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ad 0.5 m altae pauce laxae ramosae. Caules flavi vel rufescentes teretes in sicco minute rugulosi dense hirsuti, internodiis inferioribus brevioribus. Folia opposita inferiora distincte minora, petiolis brevibus 1-3 mm longis; laminae plerumque anguste ellipticae raro lineares inferiores saepe late ellipticae 3-10 (-13) cm longae et 0.5-3.5 cm latae base anguste cuneatae vel rotundatae margine remote vel dense serratae in nervis ascendenter pinatae vel supra basem divaricate trinervatae supra dense scabropilosae subtus in nervis et nervulis prominulis scabropilosae et pilosulae raro utrinque appresse strigosae subtus interdum glandulo-punctatae. Inflorescentiae diffusae terminales et in ramis variabilis terminales solitariae plerumque approximatae, pedunculis 2.5-9.0 cm longis sensim dense hirsutis vel strigosis. Capitula late campanulata 8-9 mm (raro -13) mm alta et in involucri 10-15 (-18) mm lata; squamae involucri 10-12 oblongo-ellipticae 7-8 (-12) mm longae et 2-3 (-4) mm latae herbaceae vix patentes apice acutae extus dense canescentiter pilosae vel strigosae; paleae oblongae vel oblanceolatae 6-7 (-9) mm longae et 1.5-2.0 mm latae inferne flavae glabrae apice triangulares acutae vel breviter acuminatae erectae vel leniter reflexae atrorubrescentes extus et margine superne dense scabrido-pilosulae vel strigulosae. Flores radii 6-10 in capitulo; corollae flavae, tubis 1-2 mm longis dense scabrido-pilosulis vel in partibus exterioribus glabris, limbis oblongis 5.5-8.0 mm longis et ca. 4.5 mm latis apice bilobatis extus in nervis et lobis apicalibus valde strigosis interdum glandulo-punctatis, ramis stylorum apice anguste appendiculatis. Flores disci ca. 30-40 (-50) in capitulo; corollae flavae 4.2-5.0 mm longae, tubis 1.0-1.7 mm longis glabris, faucibus 2.5-3.0 mm longis leniter infundibularibus base leniter campanulatis extus glabris, lobis triangularibus ca. 0.7 mm longis et 0.8 mm latis extus dense strigulosus non vel indistincte glanduliferis inter preter basem dense papillois; filamenta in partibus superioribus ca. 0.3-0.4 mm longa mediocriter incrassata; thecae antherarum 1.8-2.0 mm longae; appendices antherarum flavae ovatae 0.4-0.5 mm longae et 0.35-0.40 mm latae extus plerumque glabrae interdum glanduliferae raro uni-pilosulae; rami stylorum breviter lineares supra tertiis basilaribus sensim papillois non glanduliferi. Achaenia leniter complanata vel triquetra obpyramidata vel oblonga 4.5-raro 5.5 mm longa et 2 mm lata inferne glabra superne dense scabridulo-

pilosula apice valde constricta, coronis apicalibus 0.5-1.0 mm altis breviter vel longe lobatis dense pilosulo-fimbriatis extus sparse scabridulis vel puberulis non aristatis. Grana pollinis in diametro 26-30 μ m.

TYPE: BRASIL: Goiás: Luziania, saída da cidade. Erva rasteira sobre o solo, flores amarelas; serrado seco sujeito a incêndios periódicos. 25.I.1981. *E. P. Heringer 18193* (Holotype, IBGE; isotype, US). PARATYPES: BRASIL: Distrito Federal: Grota D'água próximo ao rio São Bartolomeu. Campo sujo - 15 44'S. 47 41'O. 24-03-81. *Ancelmo Braga 4* (UB); Escola Fazendária. Planta rasteira de cerrado seco, porém de encosto; planta com flores amarelas em capítulos abundantes. 20/01/78. *E. P. Heringer 16792* (US); Cerrado, immediately E. of Lago Paranoá. Elev. 975 m. Herb with several divergent prostrate stems. Heads on ascending peduncle. Rays yellow; disc yellow-orange. 9 Dec. 1965. *H. S. Irwin, R. Souza, R. Reis dos Santos 11150* (US); Cerrado, summit of Chapada da Contagem. Elev. 1100 m. Decumbent herb with 1-several stems from deep root. 14 Jan. 1966. *Irwin et al., 11675* (US); Common. Campo, north end of Lago Paranoá. Elev. 975 m. Creeping herb, the stems to 50 cm long. Heads ascending; rays yellow; disc brown. 14 March 1966. *H. S. Irwin, J. W. Grear, Jr., R. Souza, R. Reis dos Santos 13944* (US); Campo and cerrado ca. 15 km E. of Lago Paranoá, DF-6. Elev. ca. 1000 m. Ascending herb to ca. 50 cm tall. 25 Feb. 1970. *H. S. Irwin, S. F. da Fonsêca, R. Souza, R. Reis dos Santos, J. Ramos 26607* (US); Ecological Reserve S of Brasília. Elev. 3300 feet. Feb. 12, 1981. *R. M. King & L. E. Bishop 8926* (US); Chapada da Contagem; 13 km nordeste de balão em BR 020 por estrada, 20.5 km nordeste de torre de televisão. 24 Jan. 1980. *J. H. Kirkbride, Jr. & M. C. G. de Kirkbride 3096* (US); 3110 (US); Na margem de brejo e campo cerrado. Ao Córrego Cariru, ca 47°47'O. 15°52'S. 1000 m. alt. 6 Feb. 1981. *J. H. Kirkbride 3753* (UB); 4 km oeste do Rio Preto perto de DF 6, 47°22'O, 15°43'S. 12 Feb. 1981. *J. H. Kirkbride 3792* (US); Cerrado aberto e perturbado. Na região de Barra Alta, este do Córrego São Gonçalves, 15°48'S, 47°31'O. 950 m alt. 19 Feb. 1981. *J. H. Kirkbride 3902* (US); Córrego Santo Antonio do Descoberto. 17° 30'S, 48°15'W. Alt. 1050 m. 2/12/82. *G. F. de Oliveira 27* (US); Grota D'água - proximo ao rio São Bartolomeu. Campo sujo - 15 44'S, 47 41'O. 24-03-81. *P. Omar 3* (US); Perto da DF-20. 16°01'S, 48°12'W. Alt. 1.055 m. 22 Nov. 1982. *C. Proença 289* (US); Goiás: Cerrado ca. 12 km S. of Corumbá de Goiás. Elev. 1000 m. Common. Herb. ca. 45 cm tall. Rays and disc yellow. *H. S. Irwin, R. Souza, R. Reis dos Santos 10868* (US).

Two of the specimens represent notable variations, *Irwin 10868* from near Corumbá de Goiás is distinctly larger in all its parts and bears glands, and *Oliveira 27* differs by its linear leaves and appressed strigose pubescence. These two specimens are like the others in the inflorescence with no two heads from the same node, the densely strigose undersurface of the rays,

especially toward the tips, and the densely strigose outer surfaces of the disk corolla lobes.

WEDELIA HATSCHBACHII H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ca. 25-30 cm altae non vel paucè ramosae. Caules brunnescentes subhexagonales striati dense scabridi et scabriduli, internodis basilaribus brevibus superioribus 3-8 cm longis. Folia opposita subsessilia basilaria minute sub 1 cm longis et 0.6 cm latis superioribus accrescentia, petiolis ca. 1 mm longis; laminae late ellipticae 2.5-6.0 cm longae et 1.7-3.8 cm latae base late cuneatae vel leniter rotundatae margine supra mediam multo incurvate serratae apice breviter acutae obtusae fere ad basem sublongitudinaliter tri- vel quinque-nervatae supra et subtus perbreviter scabrae. Inflorescentiae terminales 1-3-capitatae, pedunculis 3-7 cm longis dense antrorse scabris. Capitula 10-13 mm alta et 13-17 mm lata (apicibus bracteorum exclusa); squamae involucri exteriores ca. 15 subcarnose herbaceae saepe late patentès lanceolatae 8-17 mm longae et 2-4 mm latae minute scabridae; bractee interiores et paleae oblongo-lanceolatae ca. 6 mm longae et 2 mm latae distaliter et in lineis medianalis minute scabridae apice anguste rotundatae. Flores radii nulli. Flores disci ca. 30-35 in capitulo; corollae flavae subcarnosae ca. 8.5 mm longae, tubis cylindræis ca. 2.5 mm longis glabris, faucibus longe infundibularibus ca. 4.5 mm longis base subtiliter campanulatis supra mediam in nervis minute scabridulis et sparse puberulis, lobis oblongo-ovatis ca. 1.5 mm longis et 0.9 mm latis extus dense minute scabridulis intus praeter basem in medio dense distincte papillois; filamenta in partibus superioribus ca. 0.4 mm longa incrassata; thecae antherarum ca. 4 mm longae; appendices antherarum flavae ovatae ca. 0.5 mm longae et latae extus glanduliferae; rami stylorum lineares non contorti non glanduliferi apice breviter acuti extus inferne glabri. Achaenia submatura 4 mm longa sericeo-setulifera apice plerumque biaristata in achaeniis peripheralis triaristata in coronis irregulariter laciniata, aristis ad 1.5 mm longis. Grana pollinis in diametro ca. 37 μ m.

TYPE: BRASIL: Mato Grosso: Mun. Rio Brilhante. Rod. BR-267, Entroncamento. Campo cerrado aberto. Capitulos amarelos. 22/X/1970. *G. Hatschbach* 25050 (Holotype, MBM; isotype, US).

Wedelia hatschbachii is clearly a member of the genus, but is distinct from all other members by its lack of ligulate flowers. The species will be discussed further in a paper on the genus *Angelphytum*.

WEDELIA HERINGERI H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis? erectae ad 0.5 m altae mediocriter laxè late ramosae. Caules cinerei teretes antrorse appresse strigosi, internodis plerumque 3-6 cm longis. Folia opposita subsessilia, petiolis indistinctis ca. 1 mm longis; laminae anguste lineares plerumque 3-7 cm longae et 1.0-

1.5 mm latae margine anguste recurvatae supra in marginis et subtus in nervis primariis appresse strigosae subtus aliter minute scabridulae et dense glandulo-punctatae. Inflorescentiae in ramis terminales unicapitatae, pedunculis 6-12 cm longis superne sensim dense strigosis. Capitula 7-9 mm alta et in involucris ad 10-12 mm lata; squamae involucris ca. 10 ellipticae 7-8 mm longae et 3.0-3.5 mm latae herbaceae apice erectae breviter acutae extus cinereo-strigosae et glandulo-punctatae; paleae oblongae vel obovatae ca. 8 mm longae et 2 mm latae apice triangulares acutae et atrescentes extus superne dense appresse strigulosae et glandulo-punctatae margine superne setulo-fimbriatae. Flores radii ca. 8-10 in capitulo; corollae non visae. Flores disci ca. 25 in capitulo; corollae flavae ca. 4 mm longae, tubis ca. 1 mm longis glabris, faucibus superne subcylindraceutis base leniter campanulatis ca. 2.5 mm longis extus glabris, lobis ovato-triangularibus ca. 0.6 mm longis et latis extus glandulo-punctatis et minute scabridulis extus solum basis exclusis dense papillois; filamenta in partibus superioribus ca. 0.3 mm longa leniter incrassata; thecae antherarum ca. 1.7 mm longae; appendices antherarum flavae ovatae ca. 0.4 mm longae et 0.35 mm latae extus glanduliferae; rami stylorum lineares leniter recurvati non glanduliferi e tertiis basilaribus sensim papillois apice penicillate longe papillois. Achaenia leniter complanata vel triquetra oblongo-obpyramidata ca. 6 mm longa et 1.5 mm lata inferne glabra superne scabrido-puberula apice valde constricta in coronis ca. 1 mm longis irregulariter denticulata margine setulo-fimbriata extus sparse pilosula non aristata. Grana pollinis in diametro ca. 25 μ m.

TYPE: BRASIL: Distrito Federal: Escola Fazendária. Planta de cerrado seco, aberto, um tanto volúvel, flores amarelas. 20/01/78. *E. P. Heringer 16793* (Holotype, IBGE; isotype, US).

The ray corollas of *Wedelia heringeri* have not been seen, but the peripheral triquetrous achenes are present and mature. There is no reason to doubt that rays were present in the younger plants. Available floral details are unlike any *Aspilota* but are similar to the various xylopodial members of *Wedelia* described here. The species is distinct in the very narrow leaves and in the widely spreading branching from near the base. The species seems particularly close to the annual species, *W. pertenuis*, described below.

WEDELIA KIRKBRIDEI H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ca. 0.5 m altae plerumque non ramosae. Caules flavi teretes vix striati glabri vel subglabri. Folia opposita, petiolis subnullis ad 1 mm longis; laminae obovatae plerumque 3-6 cm longae et 0.6-2.6 cm latae inferiores valde minores base cuneatae margine supra basem sensim crenato-serratae apice obtusae vel breviter acutae distincte supra basem ascendentiter trinevatae supra et subtus glabrae vel minute puberulae. Inflorescentiae terminales

dichasialiformes vel breviter thyrsoideae, pedunculis 3-20 mm longis puberulis. Capitula late campanulata 8-10 mm alta; squamae involucri exteriores ca. 6 subcarnosae herbaceae ovatae 6-8 mm longae et 3-4 mm latae margine integrae apice breviter acutae subobtusae extus sparse puberulae vel strigulosae; bractae interiores et paleae oblongo-ovatae apice triangulares acutae margine superne puberulo-fimbriatae extus superne puberulae et glandulo-punctatae. Flores radii ca. 8 in capitulo; corollae flavae, tubis brevibus ca. 0.5 mm longis glabris, limbis oblongis ca. 9 mm longis et 3 mm latis apice bilobatis extus dense glandulo-punctatis sparse minute setuliferis in sinibus interioribus dense argute setuliferis. Flores disci ca. 25 in capitulo; corollae flavae ca. 4.7 mm longae, tubis ca. 1.5 mm longis glabris, faucibus ca. 2.7 mm longis subcylindratis superne leniter latiores base campanulatis extus glabris, lobis triangularibus ca. 0.8 mm longis et 0.7 mm latis extus glandulo-punctatis in sinibus minute paucis setuliferis intus margine dense papilloso; filamenta in partibus superioribus ca. 0.35 mm longa valde incrassata; thecae antherarum ca. 1.8 mm longae; appendices antherarum flavae ovatae ca. 0.55 mm longae et 0.4 mm latae extus glanduliferae; rami stylorum anguste lineares non glanduliferi solum distaliter puberuli. Achaenia leniter complanata vel triquetra anguste obpyramidata ca. 4 mm longa inferne glabra superne valde constricta et dense setulifera apice in coronis ca. 0.3 mm longis setulo-fimbriata minute subaristata, aristis ad 0.6 mm longis. Grana pollinis in diametro ca. 25-27 μ m.

TYPE: BRASIL: Goiás: Morro da Cruz, 16°03'S, 47°48'W. Alt. 960 m. Erva até 0.5 m; cabeças amarelas. Campo sujo num declive muito unclinado com cascalho na superfície. 25 Jan. 1983. J. H. Kirkbride Jr. 5129 (Holotype, UB; isotype, US). PARATYPE: BRASIL: Distrito Federal: Bacia do Rio São Bartolomeu. Broto de toco pequeno; folhas ásperas com cheiro enjoativo; flores amarelas; cerrado. 27-XII-1979. E. P. Heringer 2989 (US).

The new species has a habit rather similar to *Wedelia regis* described below, but differs by the more nearly glabrous stems, the scarcely asperulous leaf surfaces, the ovate involucral bracts, and the longer strictly submarginal papillae inside the lobes of the disk corollas.

WEDELIA MACEDO H. Robinson, sp. nov.

Plantae herbaceae perennes subprostratae 0.3 m vel ultra longae mediocriter ramosae. Caules flexuosi flavo-brunnescentes subteretes vix striati dense hirsuti et glandulo-punctati. Folia opposita, petiolis brevibus ca. 1 mm longis abrupte demarctis; laminae ovatae plerumque 1.5-4.0 cm longae et 0.7-2.5 cm latae base late rotundatae margine crenato-serratae apice breviter acutae fere ad basem divaricate trinervatae supra vix insculptae scabro-pilosae et pilosulae subtus pallidiores in nervis hirsutae vel hirtellae aliter erecte pilosulae et dense glandulo-punctatae. Inflorescentiae in ramis terminales 1-3-

capitatae, pedunculis 2-3 cm longis dense hirsutis et glandulo-punctatis. Capitula late campanulata 7-8 mm alta et in involucriis ad 8-9 mm lata; squamae involucri 8-9 oblongo-ovatae ca. 5 mm longae et 2-3 mm latae herbaceae apice breviter acutae vix patentes extus dense hirsutae et glandulo-punctatae; paleae oblongae 5-6 mm longae et ad 1.5 mm latae flavae apice rubescentes et breviter argute acuminatae extus inferne glabrae superne pilosae et dense glandulo-punctatae margine superne ciliato-pilosae. Flores radii ca. 8 in capitulo; corollae flavae, tubis ca. 1 mm longis infundibularibus pilosulis puberulis et glandulo-punctatis, limbis brevibus oblongis ca. 5 mm longis et 2.8 mm latis apice breviter trilobatis extus dense glandulo-punctatis in nervis pilosulis. Flores disci ca. 35 in capitulo; corollae flavae 3.2-3.5 mm longae, tubis 0.8 mm longis glabris, faucibus ca. 2 mm longis anguste leniter infundibularibus base leniter campanulatis extus plerumque glabris in nervis superne paucae pilosulis, lobis triangularibus ca. 0.5 mm longis et latis extus glandulo-punctatis et scabridis apice scabridioribus intus praeter basem dense breviter papillois; filamenta in partibus superioribus ca. 0.25 mm longa vix incrassata; thecae antherarum ca. 1.5 mm longae; appendices antherarum ovatae 0.30-0.35 mm longae et ca. 0.25 mm latae; rami stylorum lineares valde recurvati extus supra mediam sensim papillois non glanduliferi. Achaenia leniter complanata vel triquetra obpyramidata 4.5 mm longa et 1.5 mm lata inferne glabra superne sensim dense scabridulo-pilosula apice valde constricta, coronis apicalibus ca. 0.2 mm altis glanduliferis et in marginis pilosulis, aristis dentibus vel squamellis connatis pappi nulli vel subnullis. Grana pollinis in diametro 25-30 μ m.

TYPE: BRASIL: Minas Gerais: Araxá. Compestre prostrada, amarelas. 2-II-1956. A. Macedo 4234 (Holotype, US).

The new species seems most closely related to *Wedelia bishopii* of Goiás and the Distrito Federal in its rather prostrate habit, the inflorescence form, and the pubescence of the involucre and corollas. The present species differs by its more ovate leaves with broadly rounded bases, the more sharply serrate leaf margins, the densely hirsute stems. The species is apparently also basically glanduliferous while only one collection of *W. bishopii* has shown any glandular punctations. The new species has some superficial resemblance to the type photo of *W. modesta*, but the latter has distinctly long petioles, leaves that are more cordate and acuminate, a finer pilosity, and solitary heads terminal in pseudodichotomies.

WEDELIA PERTENUIS H. Robinson, sp. nov.

Plantae herbaceae annuae ad 0.3 m altae mediocriter laxae et late ramosae; xylopodia nulla. Caules flavi subteretes non striati antrorse appresse strigosi, internodis plerumque 2-4 cm longis. Folia opposita subsessilia, petiolis indistinctis ca. 1-2 mm longis; laminae lineares plerumque 2-5 cm longae et 1.5-

2.5 mm latae margine integrae vel subintegrae planae vel subplan-
ae apice anguste acutae supra et subtus glandulo-punctatae supra
plerumque prope marginem et subtus breviter strigulosae. In-
florescentiae diffusae in nodis terminalibus et divaricate
ramosis solitariae, pedunculis 4-6 cm longis tenuibus et sensim
dense strigosis. Capitula 6-7 mm alta in involucris ad 9-11 mm
lata; squamae involucris 8-9 ellipticae 6-7 mm longae et 1.5-2.0
mm latae flavo-virides tenuiter herbaceae erecto-patentes apice
acutae extus strigosae et minute glandulo-punctatae margine
superne breviter strigoso-fimbriatae; paleae oblanceolatae ca. 6
mm longae et 1.0-1.5 mm latae scariosae superne flavescentes
apice acutae in sicco leniter rugosae extus ad medio et margine
ciliato-strigulosi superne pauca glandulo-punctatae. Flores
radii ca. 8 in capitulo; corollae flavae, tubis ca. 1 mm longis
in lineis subsinosis scabridulis aliter glabris, limbis oblongis
ca. 6 mm longis et 3 mm latis apice valde bilobatis subtus non
setuliferis sparse minute glandulo-punctatis. Flores disci ca.
35 in capitulo; corollae flavae ca. 2.8 mm longae, tubis ca. 0.8
mm longis glabris, faucibus ca. 5 mm longis leniter infundibular-
ibus base leniter campanulatis extus glabris, lobis triangular-
ibus ca. 0.5 mm longis et latis extus pauca glanduliferis in
sinibus uni- vel bi-pilosulis intus omnino dense papillosis;
filamenta in partibus superioribus ca. 0.2 mm longa vix increas-
ata in cellulis marginalibus non scleroidea; thecae antherarum
ca. 1.1 mm longae; appendices antherarum flavae ovatae ca. 0.3
mm longae et 0.25 mm latae extus dense minute glanduliferae;
rami stylorum breviter lineares leniter patententes extus supra
mediam sensim papilloso non glanduliferi. Achaenia leniter
complanata vel triquetra obpyramidata ca. 2.5 mm longa et 1.3 mm
lata superne irregulariter rugosa et base breviter flave pedun-
culata in marginis sublobata vel subalata inferne glabra superne
sparse striguloso-pilosula apice valde constricta, coronis
apicalibus subnullis minute pauca lobatis non aristatis. Grana
pollinis in diametro ca. 23 μ m.

TYPE: BRASIL: Goias: 37 km NW of Itumbiara on road to Rio
Verde. Slender much-branched herb to 1/2 m forming dense stands
in forest clearing, brown sandy soil. Ligulate Co. yellow; disc
yellow. Locally abundant. 2 Feb. 1959. H. S. Irwin 2541
(Holotype, US).

The form of the type specimen indicates that *Wedelia per-
tenuis* is an annual. In addition to the slight habit, the
species seems distinctive in the nearly glabrous lower surfaces
of the ray corollas, the unsclerified marginal cells of the
anther collar above the base, and the slightly ornate rugosity
of the achenes. The species has some resemblance to *Wedelia
longifolia* Mart. ex Baker, but the latter has more oblong leaves,
pilose or hirsute stems leaves and bracts, and as dried the rays
show evidence of a UV bull's-eye pattern.

WEDELIA REGIS H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae 0.5–1.0 m altae pauce vel non ramosae. Caules flavi vel fulvescentes teretes hirsuti vel dense pilosi. Folia opposita, petiolis 1–3 mm longis; laminae oblongae vel ellipticae plerumque 2.5–8.0 cm longae et 0.7–4.0 cm latae base anguste vel late rotundatae margine multo crenato-serratae apice breviter acutae distincte supra basem trinervatae aliter in nervis secundariis pinnatae supra dense pilosae subtus subvelutinae albo-hirtellae in nervis et nervulis prominulae. Inflorescentiae in caulibus et ramis terminales tri- vel deca-capitatae, pedunculis 1–4 cm longis dense pilosis. Capitula late campanulata 10–12 mm alta; squamae involucri 10–12 oblongae 7–13 mm longae et 3.5 mm latae apice obtusae erectae vel leniter patentes extus et distaliter intus breviter pilosulae; paleae scariosae ca. 7–8 mm longae plerumque obrhomboideae apice triangulares acutae erectae vel leniter reflexae interdum rufescentes extus inferne subglabrae in medio pilosulae distaliter dense pilosulae subapice sparsius pilosulae. Flores radii 10–12 in capitulo; corollae flavae, tubis aliquantum brevibus ca. 2 mm longis dense puberulis in lineis subsinosis sparse scabridis, limbis oblongis ca. 11 mm longis et 6 mm latis apice bilobatis vel minute trilobatis extus dense pilosulis et glandulo-punctatis. Flores disci ca. 40 in capitulo; corollae flavae ca. 6 mm longae, tubis 1.5 mm longis glabris, faucibus ca. 3.5 mm longis subcylindratis base campanulatis extus glabris, lobis triangularibus ca. 1 mm longis et latis extus multo glandulo-punctatis in sinibus minute puberulis intus dense breviter papillosis; filamenta in partibus superioribus ca. 0.35 mm longa valde incrassata; thecae antherarum ca. 2.5 mm longae; appendices antherarum flavae ovatae ca. 0.6 mm longae et 0.5 mm latae extus glanduliferae; rami stylorum lineares subcarnosi leniter reflexi extus non glanduliferi apice vix penicillati. Achaenia leniter complanata vel triquetra obpyramidata 4–5 mm longa inferne subglabra superne valde constricta et dense setulifera apice in coronis ca. 1.5 mm longis dense squamellata et setulo-fimbriata non aristata. Grana pollinis in diametro ca. 35 μ m.

TYPE: BRASIL: Distrito Federal: 43 km N of the bridge at Asa Norte on Hwy DF #17 enroute to Alto Paraíso in cut-over cerrado. Low suffrutescent herb with thick rootstock. Florets yellow, anther black. Local. Jan. 18, 1980. *R. M. King & F. Almeda 8192* (Holotype, UB; isotype, US). PARATYPES: BRASIL: Distrito Federal: Em Fazenda 28 de Maio, perto de DF-20, ca. 12 km W de Gama, 16°01'S, 48°12'W. Alt. 960 m. Erva até 60 cm; cabeças verdes. A margem de mata ciliar seca e campo cerrado. 10 Feb. 1982. *J. H. Kirkbride, Jr. 4665* (US); Perto da DF-20, alt. 1.055 m. No campo cerrado. Erva de até 50 cm. Flores amarelas. 22 Nov. 1982. *C. Proença 274* (US); Gama, forest, 16°00'S, 48°08'W. 7 March 1965. *L. B. Smith 15079* (US); Goiás: 11 km N of Federal District border off of Hwy DF #17 in cerrado.

Suffrutescent herb 0.5 m tall. Florets yellow; anthers black. Jan. 18, 1980. *R. M. King & F. Almeda 8201* (US); West of road to Monte Alegre de Goiás, 12–20 km N of Alto Paraíso de Goiás. Elev. 4000–4400 feet. Subshrub 1/2 meter tall, dry field. Flowers yellow. Feb. 7, 1981. *R. M. King & L. E. Bishop 8823* (US, distributed as *W. puberula* DC.); 5–12 km S of Alto Paraíso de Goiás, mostly E of road to São João da Aliança. Elev. 3300–3800 feet. Coarse herb from xylopodium, flowers yellow. Feb. 8, 1981. *R. M. King & L. E. Bishop 8908* (US); On ridge 115 km S along road from Alto Paraíso de Goiás to Brasília. Elev. 3300 feet. Coarse herb from xylopodium, flowers yellow. Feb. 9, 1981. *R. M. King & L. E. Bishop 8914* (US); 25 km N of Crystallina along the road to Brasília. Elev. 2200 feet. Coarse herb from xylopodium, flowers yellow. Feb. 13, 1981. *R. M. King & L. E. Bishop 8941* (US), *8943* (US); 27 km SE along road from Crystallina to Paracatu. Elev. 2600 feet. Stout herb from xylopodium, flowers yellow. Feb. 15, 1981. *R. M. King & L. E. Bishop 8971* (US); In cerrado. 15 km N of Corumbá de Goiás on road to Niquelândia, in valley of Rio Corumbá. Cerrado and low woods on sandstone slopes, ca. 1150 m elev. 14 Jan. 1968. *H. S. Irwin, H. Maxwell, D. C. Wasshausen 18596* (US); 20 km NW of Corumbá de Goiás, near Pico dos Pirineus. Wet Campo. Gallery forest and adjacent wet campo ca. 1250 m elev. 26 Jan. 1968. *Irwin et al. 19223* (US); Serra dos Pirineus, rocky slopes ca. 10 km E of Pirenópolis. Locally common on rocky slopes. Stems in clumps, to ca. 50 mm tall. Rays yellow; disc yellow-brown. 15 Jan. 1972. *H. S. Irwin, W. R. Anderson, M. Stieber, E. Y.-T. Lee 34160* (US); Cerrado and adjacent gallery forest, ca. 25 km S of Niquelândia. Elev. ca. 750 m. 24 Jan. 1972. *Irwin et al. 34956* (US); Ca. 3 km NO de Goiás Velho, 15°05'S, 50°09'O. Cerrado, s.s., com muitas rochas. Erva até 1 m; cabeças amarelas. 10 Feb. 1980. *J. H. Kirkbride, Jr. 3388* (US); Minas Gerais: Serra da Anta. ca. 5 km NW of Paracatu. Rocky hillside, recently burned over, mostly with cerrado. Elev. 800 m. Herb to ca. 75 cm tall. Rays yellow; disc yellow-brown. 4 Feb. 1970. *H. S. Irwin, E. Onishi, S. F. da Fonseca, R. Souza, R. Reis dos Santos, J. Ramos 25986* (US).

Wedelia regis seems closest to *W. puberula* DC. of those previously described, but the latter can be distinguished at a glance by the thinner textured more ovate leaves trinervate from the base, by the generally sharply serrate leaf margins, and by the generally smaller size of the heads. The new species also seems close to two of the new species described above, *W. almedae* with less distinctly trinervate leaves and projecting bases on the involucre bracts and *W. kirkbridei* with scarcely asperulous leaves and broad involucre bracts. Other details are given under those species. The present new species differs from the two that follow basically by its more clustered heads in addition to other details that can be seen in the descriptions.

WEDELIA SOUZAE H. Robinson, sp. nov.

Plantae herbaceae perennes erectae ad 1.0-1.5 m altae medio-criter ramosae. Caules fulvescentes teretes striati dense pilosi vel hirsuti vel strigosi, internodis plerumque 2-4 cm vel ultra longis. Folia opposita subsessilia vel distincte petiolata, petiolis 1-9 mm longis; laminae oblongo-ovatae vel ellipticae plerumque 1.5-7.0 cm longae et 0.5-3.0 cm latae base anguste vel late rotundatae margine anguste vel distincte reflexae superne subtiliter serrulatae vel distincte serratae apice breviter acutae base valde tri- vel quinque-nervatae supra strigosae et strigulosae rugulosae non-glanduliferae in nervis primariis leniter vel distincte insculptae subtus exsculpto-nervatae in nervis et nervulis dense strigosae saepe subsericeae inter nervulis dense glandulo-punctatae. Inflorescentiae terminales in ramis unicapitatae, pedunculis plerumque 3-7 cm longis strigosis vel dense hispidulis et minute puberulis. Capitula late campanulata 6-9 mm alta; squamae involucris 6-10 late oblongo-ellipticae 5-6 mm longae et ca. 3 mm latae apice obtusae extus dense canescentiter strigosae margine vix vel non reflexae; paleae oblongae vel obovatae 5-6 mm longae et 1.5-2.0 mm latae apice triangulares et breviter acutae saepe atrorubescens extus inferne glabrae vel subglabrae distaliter puberulae et dense glandulo-punctatae. Flores radii 6-10 in capitulo; corollae flavae, tubis ca. 1 mm longis sparse vel dense scabrido-setuliferis, limbis oblongis 9-11 mm longis et ca. 4.5 mm latis apice valde bilobatis vel minute trilobatis subtus dense glandulo-punctatis prope nervis scabrido-setuliferis, ramis stylorum ad apicem stigmataceo-papillosis. Flores disci ca. 30-35 in capitulo; corollae flavae 4.0-4.5 mm longae, tubis 1.0-1.2 mm longis glabris, faucibus ca. 2.5 mm longis leniter infundibularibus base campanulatis extus plerumque glabris, lobis triangularibus ca. 0.8-1.0 mm longis et 0.7-0.8 mm latis extus glandulo-punctatis irregulariter non vel dense setuliferis in sinibus fasciculate paucae puberulis et scabridulis intus margine et superne dense leniter papillosis; filamenta in partibus superioribus ca. 0.3 mm longa mediocriter incrassata; thecae antherarum ca. 1.5-1.8 mm longae; appendices antherarum flavae ovatae ca. 0.35-0.40 mm longae et 0.30-0.40 mm latae extus glanduliferae; rami stylorum lineares non glanduliferi. Achaenia leniter complanata vel triquetra obpyramidata 3.5 mm longa et 1.8 mm lata irregulariter pustulata inferne glabra superne dense scabridula apice valde constricta in coronis 0.5-0.7 mm longa multidentata paucae vel non scabridula non aristata, dentibus pappi apice anguste glanduliferae. Grana pollinis in diametro 25-30 μ m.

TYPE: BRASIL: Goiás: Chapada dos Veadeiros, ca. 42 km south of Cavalcante. Elev. 1000 m. Brejo. Valley with cut-over woodland and brejo. Subshrub ca. 1 m tall. Rays yellow; disc yellow-brown. 11 March 1969. H. S. Irwin, R. Reis dos Santos, R. Souza & S. F. da Fonseca 24245 (Holotype UB; isotypes, NY,

US). PARATYPES: BRASIL: Goiás: *M. A. Glaziou 21563* (US, distributed as *Viguiera oblongifolia* Gardn.); Chapada dos Veadeiros, 14°S, 47°W., 24 km NW of Veadeiros, road to Cavalcante. Elev. 1200 m. Rocky creek margin near waterfall. Subshrub ca. 1 m tall. Rays yellow-orange; disc yellowish. 22 Oct. 1965. *H. S. Irwin, R. Souza, R. Reis dos Santos 9510* (US); ca. 7 km W of Veadeiros. Gallery margin. Burned-over campo. Elev. 950 m. Shrub ca. 1 m tall. Rays yellow, disc yellow-brown. 15 Feb. 1966. *H. S. Irwin, J. W. Grear, Jr., R. Souza, R. Reis dos Santos 12888* (US); ca. 10 km W of Alto do Paraíso (formerly Veadeiros). Gallery margin, bordering campo. Campo on rocky slopes. Elev. 1000 m. 24 March 1969. *H. S. Irwin, R. Reis dos Santos, R. Souza & S. F. da Fonseca 24974* (US); ca. 18 km N of Alto do Paraíso. Gallery margin with wet campo. Gallery forest bordering riacho, with adjacent campo and cerrado. Elev. ca. 1250 m. Brittle shrub ca. 1 m tall, in dense stands. Ligules yellow; discs yellow-brown. 21 March 1971. *H. S. Irwin, R. M. Harley, G. L. Smith 32844* (US); Estrada Alto Paraíso a Campo Belo, km 38. Brejo. Arbustiva até 1 m. Capitulos amarelos. 28.11.1976. *G. J. Shepherd, J. B. de Andrade, L. S. Kinoshita & J. Y. Tamashiro 3749* (NY).

The species may have a xylopodium, but none were on the specimens and none were mentioned in the collection data. The new species seems closest to the following *Wedelia veadeirosensis* which also has solitary heads on each leafy branch. The present species differs by the roughened and more glanduliferous upper surfaces of the leaves, the more canescent pubescence of the leaf undersurface, and the possibly unique cylindrical apical glands on the segments of the pappus. Some of the specimens show irregular patchy dense scabrosity on paleae and disk corollas.

WEDELIA VEADEIROSENSIS H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis? erectae ad 1 m altae mediocriter vel multo ramosae. Caules fulvescentes subteretes dense pilosuli, internodis inferioribus ad 6-9 cm longis, internodis ramosis plerumque 1.0-1.5 cm longis. Folia opposita subsessilia, petiolis ca. 1 mm longis; laminae oblongo-ellipticae 1.2-1.5 cm longae et 0.4-0.7 cm latae base rotundatae margine superne subtiliter serrulatae apice perbreviter acutae fere ad basem et intramarginale trinervatae supra dense pilosulae et glandulo-punctatae in nervis primariis prominentes subtus exsculptae plerumque in nervis et nervulis dense pilosulae inter nervis dense glandulo-punctatae. Inflorescentiae in ramis terminalia 1- vel interdum 3- capitatae, pedunculis 11-22 mm longis dense canescentiter pilosulis et glandulo-punctatis. Capitula 7-8 mm alta et 8-10 mm lata; squamae involucri ca. 8 subaequales breviter oblongae ca. 4 mm longae et 3 mm latae margine superne et apice reflexae rotundatae vel obtusae extus dense pilosulae et glandulo-punctatae; paleae oblongae 5-6 mm longae et ca. 2.5

mm latae apice triangulares et breviter acuminatae margine integrae planae superne puberulo-fimbriatae apice saepe reflexae extus inferne subglabrae superne dense puberulae et glandulopunctatae. Flores radii ca. 6 in capitulo; corollae flavae, tubis ca. 1 mm longis in superficiali subsinosis dense puberulis et scabrido-setuliferis aliter glabris, limbis oblongis ca. 4.5 mm longis et 3 mm latis apice bilobatis subtus dense glandulopunctatis in nervis scabridulis et puberulis, ramis stylorum in lineis stigmataceis subapice terminales. Flores disci ca. 15-20 in capitulo; corollae flavae 4 mm longae, tubis ca. 1 mm longis glabris, faucibus ca. 2.5 mm longis cylindraceis base campanulatis extus plerumque glabris, lobis triangularibus ca. 1 mm longis et 0.8 mm latis extus glandulopunctatis prope sinibus pauca puberulis et scabridulis intus margine breviter dense papillois; filamenta in partibus superioribus ca. 0.35 mm longa distincte incrassata; thecae antherarum ca. 1.5 mm longae; appendices antherarum ovatae ca. 0.40-0.45 mm longae et 0.30-0.35 mm latae extus glanduliferae; rami stylorum breviter lineares subcarnosi extus non glanduliferi. Achaenia leniter complanata vel triquetra obpyramidata submatura 3.5 mm longa inferne glabra superne dense puberula et setulifera apice valde constricta in coronis ca. 1.0-1.5 mm longis valde irregulariter multi-dentata et dense puberula et setulifera non aristata. Grana pollinis in diametro 25-27 μ m.

TYPE: BRASIL: Goiás: 27 km S of Alto Paraíso. Disturbed cerrado vegetation at 2900 ft. elev. Wiry shrub 0.5-1.0 m tall. Florets yellow. Jan. 25, 1980. R. M. King & F. Almeda 8299 (Holotype, UB; isotype, US).

The new species is closely related to and sympatric with the preceding although it sometimes has more than one head on a leafy branch. The species differs from the preceding by the more glanduliferous smooth surface and more prominent costa on the upper side of the leaf, by the more reflexed margins of the involucre bracts, by the shorter internodes and smaller leaves of the branches, the apparently more easily deciduous lower leaves, the tips of the style branches of the ray flowers, the extent of papillosity on the inner surface of the disk corolla lobes, and the length and vestiture of the pappus segments.

Literature Cited

- Baker, J. G. 1884. Compositae IV. Helianthoideae, Helenioideae, Anthemideae, Senecionideae, Cynaroideae, Ligulatae, Mutisiaceae. In C. F. P. de Martius. Flora Brasiliensis. 6(3): 136-412. pl. 45-108.
- Bohlmann, F., C. Zdero, R. M. King and H. Robinson. 1982. Eudesmanolides and kaurene derivatives from *Wedelia hookeriana*. Phytochemistry 21: 2329-2333.



PLANTS of Brazil

Brazil: Goiás, 17 km S of Alto Paraíso. Disturbed
 vegetation at 2120 ft. elevation.

Shrub 0.5 m tall. Florets yellow; anthers black.

UNITED STATES

2901868

NATIONAL HERBARIUM

Robert Merrill King
 and Frank Almeida

January 25, 1980

Specimens collected for the United States National Herbarium
 Smithsonian Institution, Washington, D.C.

Wedelia almedae H. Robinson, Isotype, United States National
 Herbarium. Photos by Victor E. Krantz, Staff Photographer,
 National Museum of Natural History.



UNITED STATES

2922414

NATIONAL HERBARIUM

PLANTAE BRASILIANAE
REGALES ET EPISCOPALES

N. S. 1984 Robinson, 1984

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1984

Wedelia bahiensis H. Robinson, Isotype, United States
National Herbarium.



UNITED STATES

2950723

NATIONAL HERBARIUM

Wedelia bishopii

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA
HERBÁRIO DA RESERVA ECOLÓGICA DO IBGE

Brasil - DF

Brasil
Compositae

Wedelia

Luziania Co, saída da cidade.

Erva rasteira sobre o solo, flores amarelas;
cerrado seco sujeito a incêndios periódicos.

18193

25.1.1961

Leg: E. F. Brincker

Wedelia bishopii H. Robinson, Isotype, United States
National Herbarium.



UNITED STATES

2962293

NATIONAL HERBARIUM



Prefeitura Municipal de São Paulo

Município de São Paulo

Estado de São Paulo

Cidade de São Paulo

Rua da Consolação, 1000

Cidade de São Paulo

Estado de São Paulo

Cidade de São Paulo

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Wedelia hatschbachii H. Robinson, Isotype, United States
National Herbarium.



INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA,
FACULDADE DE AGRICULTURA, RESERVA ECOLÓGICA DO PONCADOR.

Brasil - DF

Brasil

Compositae

Wedelia heringeri H. Robinson, Isotype

Brasília-DF (Escola Fazendária).

Planta de cerrado seco, aberto, um tanto
volúvel, flores amarelas.

nº 16793

20/C1/76

Leo: Ezechias P. Heringer

UNITED STATES

2928456

NATIONAL HERBARIUM

Wedelia heringeri H. Robinson, Isotype, United States
National Herbarium.



UNITED STATES

2962361

NATIONAL HERBARIUM

Wedelia kirkbridei H. Robinson, Isotype, United States National Herbarium.



FLORA DO BRASIL

HERBÁRIO A. MACEDO

CAIARA D'ONFAL-ITN - BUIUTUARA - MINAS GERAIS - BRASIL

Nome: wedelii

Nome:

Nome:

Nome:

Nome:

Nome:

Nome:

Wedelia macedoi H. Robinson, Holotype, United States National Herbarium.



PLANTS OF BRAZIL

Determined at The University of Texas

Herbarium

Wedelia pertenuis H. Robinson, n. sp.
 GOIAS: 37km. S.W. of Itumbara on road
 to Rio Verde. Slender much-branched
 herb to 1/2m. forming dense stands in
 forest clearing, brown sandy soil. Lig-
 ulate to yellow; disc yellow. Locally
 abundant.

DATE 2 February 1999

CRAIG R. S. HENRY

NO. 2541

Wedelia pertenuis H. Robinson, Holotype, United States
 National Herbarium.



UNITED STATES

2901863

NATIONAL HERBARIUM

PLANTS of Brasil

... Distrito Federal. 43 km N of the bridge at Asa
 ... 1980. PE #17 enroute to Alto Paraiso in a hot-over
 ...

... tomentose herb with thick rootstock. Florets
 ... anther black. Local.

Robert Merrill King
 and Frank Almeida

January 18, 1980

Specimens collected for the United States National Herbarium
 United States Department of Agriculture, Washington, D.C.

Wedelia regis H. Robinson, Isotype, United States National
 Herbarium.



THE NEW YORK BOTANICAL GARDEN
Plants of the Paraíba do Brazil
Estado do Ceará
Cidade de Fortaleza

No. 26245

Det. 11. 1969

Shrub ca. 1m tall. Rays yellow;
disc yellow-brown. Brejo, Valley
with cut-over woodland and brejo,
ca. 12km south of Cavalcante. Elev.
1400 m.

P. A. Brown, E. Reis dos Santos,
E. Souza, & S. F. de Figueiredo 11 March 1969

1969

Plant material collected with the collaboration of the Universidade de Fortaleza and
the Instituto de Pesquisas e Experimentação do Estado, supported in part by
a grant from the National Science Foundation.

UNITED STATES

2515612

NATIONAL HERBARIUM

Wedelia souzae H. Robinson, Isotype, United States National
Herbarium.



UNITED STATES

2901866

NATIONAL HERBARIUM

PLANTS of Brazil

Cytological and/or Biochemical Analysis

No. 8293

Wedelia veadeiroensis H. R.Herb. Bras. Goiás, 27 km S. of Alto Paraíso. First plant
of cerrado vegetation at 2900 ft. elevation.

Very shrubby 0.5 - 1 m. tall. Florets yellow.

Robert Merrill King
and Frank Almeida

January 25, 1960

Specimens collected for the United States National Herbarium,
Smithsonian Institution, Washington, D.C.

Wedelia veadeiroensis H. Robinson, Isotype, United States
National Herbarium.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXXIII.

NEW SPECIES OF *ASPILIA* FROM SOUTH AMERICA.

Harold Robinson
Department of Botany
Smithsonian Institution, Washington, D.C., 20560.

The present paper validates the names of one new species of *Aspilia* from Ecuador and three new species from Brasil. This is to allow use of the names in reports and discussions. Other probable undescribed species from Brasil will be treated in a later paper.

The present species are placed in *Aspilia* rather than *Wedelia* with some reservations. The species with sterile ray flowers which form the genus *Aspilia* are rather clearly not a single natural group but relate to more than one element within *Wedelia*. There is also uncertainty regarding the Madagascan type of *Aspilia*, the type apparently having been lost and no extant collections matching the description and illustration. Still, in the absence of clear evidence, *Aspilia* is a convenient segregate, and the sterility of rays does seem to have stability at the level of large species groups. With a few exceptions such as *Wedelia brachycarpa* Baker of the Paraguay area, *Aspilia* seems to contain all the species in the bigeneric complex that have strong fiber sheaths on the veins of the disk corolla throats and that have black anther appendages. It would be wrong to assume at this time that all of *Aspilia* will necessarily fall into the synonymy of *Wedelia*.

ASPILIA ANDERSONII H. Robinson, sp. nov.

Plantae fruticosae 1.0-1.2 m altae mediocriter ramosae. Caules fulvescentes vel cinerascetes teretes et striati perdense hirsuti et hirtelli. Folia opposita subsessilia, petiolis ca. 0.5 mm longis; laminae ovatae plerumque 1.5-3.5 cm longae et 1.0-1.8 cm latae base late rotundatae vel subcordatae margine pauce crenato-serratae apice breviter acutae fere ad basem divaricate trinervatae supra dense pilosae subtus cinereo-tomentosae. Inflorescentiae in ramis foliosis terminales 1-3-capitatae, pedunculis 5-15 mm longis dense hirsuto-tomentosis. Capitula ca. 11-13 mm alta et 10-12 mm lata; squamae involucri 20-24 oblongae subimbricatae 5-10 mm longae et 2-3 mm latae plerumque aut inferne pallidae in partibus apicalibus ca. 2 mm longis plerumque distincte reflexae herbaceae atro-virides intus distincte pilosulae margine inferiore dense hitello-fimbriatae; paleae ca. 9-10 mm longae inferne oblongae ca. 1.5 mm latae et margine vix serratae superne oblongo-ovatae ca. 0.8 mm latae

in sicco mediocriter contortae purpurascentes acutae extus in medio canescentiter minute puberulae. Flores radii ca. 10 in capitulo; corollae flavae, tubis ca. 3 mm longis angustis inferne glabris superne sparse puberulis, limbis oblongis ca. 8 mm longis et 5 mm latis base abrupte subtruncate latioribus in sinibus interioribus dense pilosulis apice bilobatis. Flores disci ca. 20-25 in capitulo; corollae flavae, tubis ca. 2.0-2.5 mm longis cylindraceis glabris, faucibus anguste subcampanulatis ca. 3.5-4.0 mm longis in nervis mediocriter fibrillosis extus plerumque glabris, lobis triangularibus ca. 1.2 mm longis et latis extus base puberulis margine et superne dense scabridulis intus margine dense longe papillose fimbriatis; filamenta in partibus superioribus ca. 0.4 mm longa distincte incrassata; thecae antherarum ca. 3.0-3.3 mm longae nigrae; appendices antherarum ovatae ca. 0.35 mm longae et 0.45 mm latae nigrae; rami stylorum breviter lineares supra medio dense puberuli inferne pauca papilloso. Achaenia ca. 5.5 mm longa et 2 mm lata leniter compressa dense hispidula base late rotundata apice constricta breviter coronata; coronae pappi breviter fimbriatae. Grana pollinis in diametro 30-33 μ m.

TYPE: BRASIL: Minas Gerais: Serra do Espinhaço. Ca. 18 km by road SW of Diamantina on road to Curvelo; elev. 1400 m; steep rocky (quartzite) hillside sloping down to gallery forest, with seeps and sedge meadows just above forest. Brittle shrub 1.2 m tall; rays yellow; rocky hillside. 10 April 1973. *W. R. Anderson 8510* (Holotype, UB; isotype, US). PARATYPES: BRASIL: Minas Gerais: Serra do Espinhaço. Ca. 8 km N of Gouveia on road to Diamantina; elev. 1220 m. Rocky (sandstone) cerrado and open rocky hillsides with white sandy soil, sloping down to grassy brejo, creek, and adjacent gallery forest. Rocky hillside. Slender shrub 1 m tall; flowers yellow. 4 Feb. 1972. *W. R. Anderson, M. Stieber, J. H. Kirkbride, Jr. 35395* (US); Ca. 15 km S of Diamantina, Município de Datas; sandstone hills with steep rock faces and grassy or shrubby vegetation; elev. 1250 m. Shrub 1 m tall; flowers yellow. 5 Feb. 1972. *Anderson et al. 35556* (US).

The new species seems most closely related to *Aspilia tomentosa* Baker which also has pale tomentum on the undersurface of the leaves and graduated involuclral bracts with reflexed tips. The new species differs markedly by its subsessile broadly based rather than elliptical leaves. The pubescence of the plants also seems coarser and more spreading on the stems leaves and bracts.

ASPILIA DIFFUSIFLORA H. Robinson, sp. nov.

Plantae fruticosae 1.0-1.5 m altae mediocriter vel multo ramosae. Caules fulvescentes teretes et striati dense hirtelli et hispiduli. Folia opposita subsessilia, petiolis ca. 0.5 mm longis; laminae late ovatae plerumque 1-3 cm longae et 0.5-2.0 cm latae base late rotundatae vel subtruncatae margine pauca

serrulatae apice breviter acutae vel obtusae fere ad basem divaricate trinervatae supra et subtus scabridae subtus leniter pallidius virides. Inflorescentiae solitariae in ramis foliosis axillares et terminales, pedunculis 3-7 mm longis dense antrorse sericeis. Capitula 10-15 mm alta et 7-10 mm lata; squamae involucri ca. 10 herbaceae anguste ovatae 10-11 mm longae exteriores inferne 1.5-2.5 mm latae apice erectae anguste acutae extus interiores scariosae superne sparse scabridulae apice obtusae; paleae ca. 11 mm longae base oblongae et margine irregulariter serratae superne scariosae oblongo-lanceolatae acutae minute serrulatae extus subglabrae interdum rubescentes. Flores radii ca. 8 in capitulo; corollae flavae, tubis ca. 3 mm longis peranguste infundibularibus extus glabris, limbis oblongis 7-8 mm longis et ca. 3 mm latis base in marginem interiorem scabridulis apice bilobatis. Flores disci ca. 12 in capitulo; corollae flavae ca. 7 mm longae, tubis ca. 1.5 mm longis cylindraceutis extus glabris, faucibus anguste subcampanulatis ca. 4.5 mm longis in nervis in partibus mediis leniter fibrillosis extus glabris, lobis triangularibus ca. 1 mm longis et 0.8 mm latis extus scabridulis intus margine dense longe papillose fimbriatis; filamenta in partibus superioribus ca. 0.3 mm longa vix incrassata; thecae antherarum ca. 3.5 mm longae nigrae; appendices antherarum ovatae ca. 0.35 mm longae et latae nigrae; rami stylorum lineares extus supra mediam dense puberuli. Achaenia ca. 5 mm longa et 2 mm lata leniter compressa dense hispidula base subtruncata apice contricta breviter coronata, coronae pappi breviter fimbriatae. Grana pollinis in diametro ca. 33 μ m.

TYPE: BRASIL: Minas Gerais: Serra do Espinhaço. Ca. 17 km SW of Gouvêia, Município de Gouvêia, Km 258 on M.G. 259; steep rocky hillside below sandstone cliffs, stream at base of hills, and recently burned cerrado between hills; elev. 1000-1050 m. Shrub 1-1.3 m tall; flowers bright yellow; hillside. 7 Feb. 1972. W. R. Anderson, M. Stieber, J. H. Kirkbride, Jr. 35649 (Holotype, UB; isotype, US). PARATYPE: BRASIL: Minas Gerais: Serra do Espinhaço. 30 km by road SW of Gouvêia, at km 60 on road to Curvelo; elev. 1150 m; pebbly cerrado and sandy, grassy campo. Wiry shrub 1.5 m tall; rays bright yellow; cerrado. 11 April 1973. W. R. Anderson 8597 (US).

The new species seems most closely related to species such as *Aspilia subpetiolata* Baker which shares the diffuse inflorescence and the non-reflexed outer involucre bracts. The latter species differs by the elliptical leaves with more prominent spreading pinnate venation, by the coarser scabrid pubescence rather than antrorse rather appressed pubescence, by the near restriction of the hairs of the leaf undersurface to the main veins, and by the mostly elongate peduncles on the heads.

ASPILIA JUGATA H. Robinson, sp. nov.

Plantae suffruticosae et fruticosae 1.2-2.0 m altae non vel mediocriter ramosae. Caules fulvescentes teretes et striati

longe hirsuti et dense minute stipitate glanduliferi. Folia opposita sessilia; laminae oblongo-lanceolatae plerumque 3-7 cm longae et 0.8 cm latae base truncatae vel subcordatae margine subserrulatae apice acutae supra et subtus minute stipitate glanduliferae supra scabridae ad basem in nervis hirsutae subtus pilosulae in nervis primariis et secundariis longe scabridae, nervis secundariis pinnatis 350-450 ascendentibus utrinque ca. 7-9. Inflorescentiae terminales dense corymbosae pauci-capitatae. Capitula 10-12 mm alta et 7-9 mm lata; squamae involucri 10-12 oblongo-lanceolatae ca. 8 mm longae ca. 2.5 mm latae apice anguste acutae superne herbaceae extus pilosulae et minute glanduliferae margine dense pilosulo-fimbriatae; paleae ca. 8 mm longae base oblongae et margine sensim irregulariter laciniae superne subduratae lanceolatae argute acutae subintegrae minute scabridulae rubrescentes. Flores radii ca. 8 in capitulo; corollae flavae, tubis ca. 3 mm longis extus sparse hirtellis et puberulis in lobis minutis interioribus dense hirtellis, limbis late oblongis 7-9 mm longis et 4-5 mm latis apice plerumque trilobatis, lobis mediis minoribus. Flores disci ca. 15 in capitulo; corollae flavae ca. 6 mm longae, tubis ca. 1.5 mm longis cylindraceis glabris, faucibus anguste subcampanulatis 3.0-3.5 mm longis in nervis inferne leniter fibrillosis extus sparse pilosulis, lobis triangularibus ca. 1 mm longis et 0.8 mm latis extus pilosulis ad margine scabridioribus intus margine dense longe papillose fimbriatis; filamenta in partibus superioribus ca. 0.35 mm longa vix incrassata; thecae antherarum ca. 2.5 mm longae nigrae; appendices antherarum 0.4 mm longae et latae nigrae; rami stylorum lineares extus supra mediam dense puberuli. Achaenia ca. 6.5 mm longa et 2 mm lata compresse quadrangulata hispidula base subtruncata apice constricta breviter coronata; coronae pappi breviter fimbriatae. Grana pollinis in diametro ca. 30 μ m.

TYPE: BRASIL: Minas Gerais: Serra do Espinhaço. 3.5 km by road SW of Rio Jequití and Mendanha; elev. 880 m; dense woods on hillside interrupted by quartzite rocks. Shrub 1.2 m tall; rays bright yellow; on rocks. 14 April 1973. *W. R. Anderson 8930* (Holotype, UB; isotype, US). PARATYPES: BRASIL: Minas Gerais: Serra do Espinhaço. ca. 15 km N of São João da Chapada. Elev. 975 m. Cut-over slope forest. Slender shrub to ca. 2 m tall. Rays yellow; disc yellow-brown. 23 March 1970. *H. S. Irwin, S. F. da Fonseca, R. Souza, R. Reis dos Santos, J. Ramos 28108* (US); 22 km from Diamantina, along road NE to Mendanha. Elev. 2800 ft. Flower yellow. Jan. 19, 1981. *R. M. King & L. E. Bishop 8564A* (US).

The new species does not seem to have particularly close relatives among the described members of the genus. The species is most distinctive in the long straight stems with the marked pairing of the sessile leaves. The pinnate venation is also notable because of the elongate blades with many veins. The length of the hairs on the primary leaf vein is distinctive.

ASPILIA PASTAZENSIS H. Robinson, sp. nov.

Plantae fruticosae subprostratae mediocriter ramosae. Caul-es subquadrangulares dense antrorse subappresse scabridi. Folia opposita, petiolis 3-7 mm longis; laminae ovatae plerumque 4-7 cm longae et 2.0-2.5 cm latae base late acutae margine vadosae serratae apice anguste acutae vel vix acuminatae fere ad basem trinervatae supra et in nervis et nervulis subtus scabridae. Inflorescentiae in ramis terminales pauci-capitatae, pedunculis 0.7-1.5 cm longis dense antrorse sericeis. Capitula ca. 8-9 mm alta et 7-8 mm lata; squamae involucris 6-7 herbaceae 7-8 mm longae et ca. 3 mm latae apice patentes utrinque scabridae; paleae apice subscariosae subglabrae rotundatae vel obtusae minute puberulo-fimbriatae. Flores radii nulli. Flores disci ca. 22-25 in capitulo; corollae flavae ca. 5 mm longae, tubis cylindraceutis ca. 1.5 mm longis glabris apice subabrupte latioribus, faucibus anguste infundibularibus 3.2-3.5 mm longis in nervis fibrillosis extus glabris; lobis triangularibus ca. 0.7-0.8 mm longis et 0.6 mm latis extus scabridulis intus margine dense longe papillose fimbriatis; filamenta in partibus superioribus ca. 0.3 mm longa; thecae antherarum ca. 2 mm longae nigrae; appendices antherarum parvae ca. 0.25 mm longae et 0.2 mm latae nigrae; rami stylorum anguste lineares extus ad basem puberuli. Achaenia ca. 5 mm longa et 1 mm lata anguste obpyramidata puberula superne sparse pilosula superne valde elongate constricta et minute 3-4-alata; pappi coroniformes irregulariter breviter fimbriati. Grana pollinis in diametro ca. 22 μ m.

TYPE: ECUADOR: Pastaza: Lorocachi. About 5 km S-SW of the military camp. Wet primary forest. Alt. 200 m. (75°58'W 1°38'S). Shrubby creeping. Leaves scabrous. Flowers yellow. May 27, 1980. *J. Brandbyge & E. Asanza C. 31088* (Holotype, AAU; isotype, US).

The species is most distinctive in the lack of rays, a feature that will be considered further in a paper on the genus *Angelphytum*. Checking in the axils of the bracts in the best preserved heads on the plant shows no indication of flowers outside of those with disciform corollas and compressed achenes. The lack of triquetrous outer achenes, the presence of distinct fiber sheaths on the veins of the corolla throats, and the black anther appendages all indicate that the species is an *Aspilia* rather than a *Wedelia*. In addition to the lack of rays, the new species differs from *A. eggensii* Hieron., also of Ecuador, by the smaller heads and the lack of black pigment in the disk corollas, and it differs from *A. jelskii* Hieron., of northern Peru, by the less narrow and less acuminate leaves.



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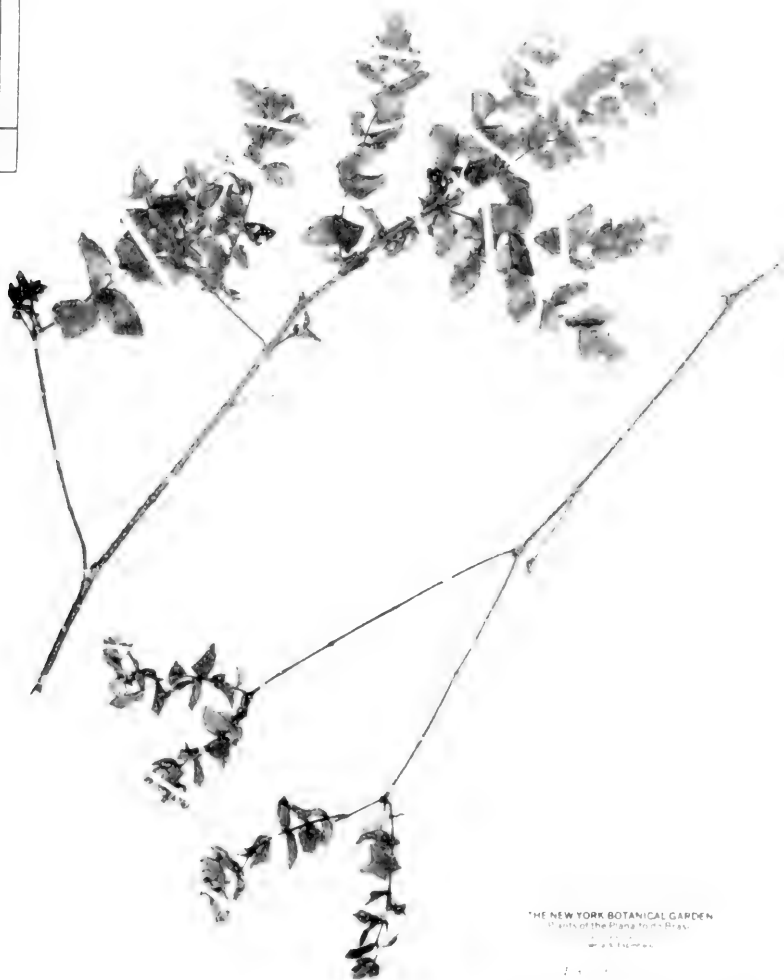
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H. Anderson

1 - April 1953

Aspilia andersonii H. Robinson, Isotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



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1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

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... tall; flowers white, yellow;
... from 100 to 200 ft. high, ...
... on the ... steep,
... below sandstone cliffs,
... of hills, and recently burned
... hills; elev. 100 - 150 ft.

UNITED STATES.

2515790

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6. A. A. Kiselev, *ibid.*, 1972.

1. The Commission has received information from the Government of the Republic of the Philippines that the Government is planning to conduct a series of military operations in the area of the Philippine Sea, which is a part of the South China Sea. The Commission is concerned that these operations may result in the loss of life and property, and it is therefore urging the Government to exercise extreme caution and to avoid any actions that might lead to a conflict.

Aspilia diffusiflora H. Robinson, Isotype, United States National Herbarium.



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Aspilia pastazensis H. Robinson, Isotype, United States
National Herbarium.

ADDITIONAL NOTES ON THE GENUS *Gmelina*. I

Harold N. Moldenke

Herewith follows the start of a series of additional notes in continuation of my first paper on this genus published in the last previous issue of the present journal. More may be expected to follow as space becomes available.

Gmelina arborea Roxb.

Additional bibliography: Narayana Aiyar & Kolammal, Pharmacog. Ayur. Drugs. 1964; Nevill, Dept. Agric. Tech. Serv. Pretoria Tech. Commun. 12: 173--175. 1964; Oberholzer, Dept. Agric. Tech. Serv. Pretoria Tech. Commun. 12: 169--172. 1964; Peh, For. Res. Inst. Keping Malaya Res. Paper 44: 1--21. 1964; Rao & Sastry, Bull. Bot. Surv. India 6: 160, 164, & 281. 1964; Ray in Lahiri, West Beng. For. 88. 1964; Srivastava, Indian Journ. Ent. 1964: 419--432. 1964; Thwaites & Hook. f., Enum. Pl. Ceyl., imp. 2, 244. 1964; Vyas, Journ. Indian Bot. Soc. 43: 326 & 331. 1964; Brunck, Bois Forêts Trop. 103: 17--25. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 694. 1965; Collado, Bur. For. Philip. Res. Notes 70. 1965; Datta, Handb. Syst. Bot. 182 & 183. 1965; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Map Ser. 2: 21 & 31. 1965; Gaussen, Viart, Legris, & Labroue, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 5: 130. 1965; Maheshwari & Singh, Dict. Econ. Pl. India 77 & 128. 1965; Mukerjee, Bull. Bot. Surv. India 7: 135. 1965; Nair, Asia Monogr. India 1 (5): [Pollen Gr. W. Himal. Pl.] 35. 1965; Neal, In Gard. Haw., ed. 2, 720. 1965; Nielsen, Introd. Flow. Pl. W. Afr. 161. 1965; Roberts, Prelim. Checklist Pests Dis. Plantat. Trees Nigeria 30. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 46. 1965; M. R. Sm., Cocoa Res. Inst. Tech. Bull. 9: 1--68. 1965; Swift, Nature 207: 436--437. 1965; Van Steenis & Jacobs, Fl. Males. Bull. 20: 1329 & 1341. 1965; Vyas, Journ. Indian Bot. Soc. 44: 55. 1965; R. M. C. Williams, Proc. XII Internat. Cong. Ent. Lond. 675--676. 1965; Anon., Fast Grow. Trop. Trees I Commonw. For. Inst. Mimeo. Ref. TT/5/1. 1966; Ansell, The Puku 4: 1--16. 1966; Burkill, Dict. Econ. Prod. Malay Penins. 1: 1105--1106. 1966; Esan, Study Variat. Struct. Feat. Prop. *Gmelina* [thesis]. 1966; Esan, Notes Prop. Visit. Lamb. 1966; Forsythe, Check List Agric. Insects Ghana. 1966; Greezaillah Yeom & Sandras., Mal. For. 1966: 140--151. 1966; Gaussen & al., Trav. Sect. Scient. Techn. Inst. Franc. Pond Hors 7: 42 & 99 (1966) and 8: 35. 1966; Jain & De, Bull. Bot. Surv. India 8: 247. 1966; L. J. King, Weeds World 58. 1966; Leggate, Tech. Note 1: 66. 1966; Majumdar, Bull. Bot. Soc. Beng. 20: 102. 1966; Naithani, Bull. Bot. Surv. India 8: 259. 1966; Ramaswami, Study Flow. Pl. Bangalore [thesis] 1031--1033 & 1412. 1966; Rao & Rabha, Bull. Bot. Surv. India 8: 296 & 301. 1966; Sandrasegaran, Mal. For. 29: 97--101, fig. 3. 1966; Sebastine & Henry, Bull. Bot. Surv. India 8: 304 & 309. 1966; Subramanyam & Henry, Bull. Bot. Surv. India 8: 208 & 212. 1966; Freezaillah Yeom & Sandrase-

garan, Mal. For. 29: 140--141. 1966; Anon., Ind. Bibliog. Bot. Trop. 4 (1): 60. 1967; Berhaut, Fl. Sénégal, ed. 2, 122 & 126. 1967; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 3, 2: 504--505. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 11. 1967; J. E. D. Fox, Commonw. For. Rev. 46: 138--144. 1967; R. K. Gupta, Season. Fl. Indian Sum. Resorts Moos. 67, 81, & 241. 1967; Joseph & Vajravelu, Bull. Bot. Surv. India 9: 26. 1967; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 207, 209, & 224. 1967; Mold., Résumé Suppl. 15: 8. 1967; Ornduff, Reg. Veg. 50: 86 & 121. 1967; Panigr. & Saran., Bull. Bot. Surv. India 9: 251. 1967; Sandrasegaran, Biol. Abstr. 48: 2312. 1967; Santapau, Bull. Bot. Surv. India 8: 38. 1967; Srivastava, Quart. Journ. Crude Drug Res. 7: 1053. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: lvi. 1967; D. & E. Venkata Rao & Viswanadham, Curr. Sci. (India) 36: 71--72. 1967; D. & E. Venkata Rao & Viswanadham, Hort. Abstr. 37: 57. 1967; Vyas, Journ. Bomb. Nat. Hist. Soc. 64: 219. 1967; Freezaillah Yeom & Sandrasegaran, Biol. Abstr. 48: 5531. 1967; Anon., Biol. Abstr. 49 (7): S.71. 1968; Badhwar & Fernandez, Edible Wild Pl. Himal. 285. 1968; F. G. Browne, Pests Dis. For. Plantat. Trees 15, 29, 36, 63, 77, 80, 103, 125, 168, 192, 193, 238, 239, 255, 261, 262, 290, 291, 311, 316, 332, 361, 362, 373, 376, 395, 402, 413, 415, 435, 482, 534, 541, 548, 549, 557, 576, 589, 605, 634, 647, 666, 672, 688, 689, 697, 698, 703, 715, 718, 728, 735, 736, 756, 818, 923, 938, 965, 982, 988, & 1069. 1968; Carrick & al., Chem. Pharm. Bull. Tokyo 16: 2436--2441. 1968; Das, Palist. Journ. For. 18: 315. 1968; Deb, Indian For. 94: 755. 1968; Deb, Sengupta, & Malick, Bull. Bot. Soc. Beng. 22: 174 & 210. 1968; J. L. Ellis, Bull. Bot. Surv. India 10: 157. 1968; Gaur & Gupta, Journ. Res. Indian Med. 3: 43--48. 1968; Gunawardena, Gen. Sp. Pl. Zeyl. 147. 1968; Inamdar, Bull. Bot. Surv. India 10: 130. 1968; Khan, Fat Med. Groth Trees 4: 63 & 64. 1968; Kribs, Comm. For. Woods, ed. 3, 160, fig. 330. 1968; A. F. L. Lamb, Fast Grow. Timb. Trees Lowl. Trop. 1--31. 1968; Meijer, Bot. Bull. Herb. For. Dept. Sabah 10: 223. 1968; Mohrhard, Dict. Cat. Nat. Agric. Lib. 27: 402. 1968; Mold., Résumé Suppl. 16: 7 & 9. 1968; G. C. Morrison, Pacif. Sci. 22: 184--193. 1968; Mukherjee & Chanda, Bull. Bot. Soc. Beng. 22: 94 & 95. 1968; Patel, Fl. Melghat 263--264. 1968; Uphof, Dict. Econ. Pl., ed. 2, 71, 246, 327, & 428. 1968; Vajravelu, Joseph, & Chandrasekaran, Bull. Bot. Surv. India 10: 68 & 78. 1968; Yeom & Sandrasegaran, Biol. Abstr. 49: 5531. 1968; Anon., Biol. Abstr. 50 (10): B.A.S.I.C. S.81. 1969; Anon. in Joshi, Indian For. 94: 152. 1969; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Ind. 1968: 54. 1969; Bhattacharjee & Das, Econ. Bot. 23: 275. 1969; Bolkhov., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 715. 1969; Caaduhuri, Bull. Bot. Soc. Beng. 23: 114, 115, 119, & 123. 1969; Cherian & Pataskar, Bull. Bot. Surv. India 11: 392. 1969; Corner & Watanabe, Illust. Guide Trop. Pl. 760. 1969; J. E. D. Fox, Biol. Abstr. 50: 6299. 1969; Hughes & Esan, Trop. Sci. 11: 23--37. 1969; Joshi, Indian For. 95: 152 & 153. 1969; Kapoor, Singh, Kapoor, & Srivastava, Lloydia 32: 303. 1969; Longman in Woolhouse, Dormancy Surviv. 473. 1969; Misra, Bull. Bot. Surv. India 11: 327. 1969; Mold., Résumé Suppl. 18: 8. 1969; Palit, Indian For. 95: 226. 1969; Preston in

Synge, Suppl. Dict. Gard. 903. 1969; [Qureshi] in Joseph, Indian For. 95: 152. 1969; Rau, Bull. Bot. Surv. India 10 Suppl. 2: 62. 1969; Roberts, Commonw. For. Inst. Oxford Paper 44: 7--12, 21, 22, 25, 33, 34, 41, 43, 47, 50, 67, 68, 72, 73, 75, 127, 135, 183, & 184. 1969; Santapau & Shah, Journ. Bomb. Nat. Hist. Soc. 66: 438. 1969; Sawyer & Chermisier, Nat. Hist. Bull. Siam Soc. 23: 126. 1969; Schroeder, Biol. Abstr. 50: 10809. 1969; G. L. Shah, Indian For. 95: 270 & 275. 1969; Shah & Deshpande, Bull. Bot. Surv. India 11: 283. 1969; Venkatarreddi, Bull. Bot. Surv. India 11: 258. 1969; Agarwal, Wood-yield. Pl. India 33. 1970; Ahmad, Pakist. Journ. For. 20: 220. 1970; Anon., Biol. Abstr. B.A.S.I.C. 51 (13): S.87. 1970; Babbar & al., Indian Journ. Exp. Biol. 8: 304--312. 1970; Farnsworth, Pharmacog. Titles 5 (3): iii & item 2397 (1970), 5 (4): vi & item 3987 (1970), and 5 (11): viii & item 14140. 1970; Gaussen, Legris, Blasco, Meher-Homji, & Troy, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 10: 56, 57, 83, & 128. 1970; Jain & Tarafder, Econ. Bot. 24: 254. 1970; Joshi & Singh, Zeit. Naturforsch. B.25: 693--694. 1970; Lamb, Bol. Inst. For. Latino-Am. 33/34: 22--51. 1970; Lamb & Cooling in Frankel & Bennett, Genet. Resources 376--378. 1970; Odeyemi, Suom. Kemistis. Tiedonant. [Finn. Kem. Medd.] 41: 57--70. 1970; Puri, Quart. Journ. Crude Drug Res. 10: 1560. 1970; D. V. & E. V. Rao, Indian Journ. Pharm. 32 (5): 140--141. 1970; "J.G.S.", Biol. Abstr. 51 (13): 7097. 1970; Saxena, Bull. Bot. Surv. India 12: 156. 1970; Shah & Patel, Bull. Bot. Surv. India 12: 25. 1970; Anon., Biol. Abstr. 52 (7): B.A.S.I.C. S.97 (1971) and 52 (6): B.A.S.I.C. S.106. 1971; Anon, Indian For. 97: 158 & 160. 1971; Balan Menon, Malay. For. Rec. 27: 102. 1971; Blasco, Trav. Sec. Scient. Techn. Inst. Franç. Pond. 10: 47 & 149. 1971; Brandis, Indian Trees, imp. 5, 509. 1971; Danganan, Biol. Abstr. 52: 8956. 1971; Farnsworth, Pharmacog. Titles 5, Cumul. Gen. Ind. (1971), 6 (1): viii & item 1370 (1971), 6 (2): iv & item 2721 (1971), and 6 (8): ix & item 14208. 1971; Fonseka & Vinasithamby, Prov. List Local Names Flow. Pl. Ceyl. 21, 27, & 93. 1971; J. E. D. Fox, Trop. Ecol. 12: 2. 1971; Govindachari, Parthas., Desai, & Mohamed, Journ. Indian Chem. 9: 1027. 1971; Hartwell, Lloydia 34: 386. 1971; Inamdar & Patel, Indian For. 97: 328. 1971; Joshi & al., Journ. Indian Chem. Soc. 48: 1175--1176. 1971; Mold., Fifth Summ. 1: 214, 237, 268, 270, 271, 276, 280, 281, 283, 289, 296, 301, 305, 324, 363, & 472 (1971) and 2: 523, 524, 526, 569, 572, 609, 614, 622, 879, & 970. 1971; Mold., Phytologia 20: 494 (1971) and 21: 220. 1971; Patel, For. Fl. Gujarat 230. 1971; Puri, Quart. Journ. Crude Drug Res. 11: [1746]. 1971; Rao, Vankata, & Rao, Biol. Abstr. 52: 3659. 1971; Roxb., Fl. Indica, ed. 2, imp. 3, 486. 1971; Vartak & Chitnis, Indian For. 97: 154 & 160. 1971; Anjaneyulu, Tterahed. Lett. 22: 2179--2182. 1972; Anon., Biol. Abstr. 53 (4): B.A.S.I.C. 53 (4): S.109 & S.145 (1972) and 53 (8): B.A.S.I.C. S.110. 1972; Dymock, Warden, & Hooper, Pharmacog. Indica, imp. 2 [Hamdard 15:] 348. 1972; Encke & Buchheim in Zander, Handwörterb. Pfl.-namen, ed. 10, 269, 1972; Farnsworth, Pharmacog. Titles 7 (2): vi & items 3283 & 3965 (1972), 7 (3): v & 177 (1972), 7 (4): xi & 222 (1972), 7 (5): v & 223 (1972), 7 (11): v & 739 (1972), and 8 (9): vi & 582. 1972; Gamble, Man. Indian Timb., ed. 2, imp. 3, 537--539 & 778. 1972;

- Govindachari, Parthas., & Desai, Indian Journ. Chem. 10: 1120--1122. 1972; Govindachari, Parthas., & Desai, Biol. Abstr. 53: 2214. 1972; KochaR, Dixit, & Somaya, Mosq. News 32: 114--115. 1972; Korr, Biol. Abstr. 53: 4494. 1972; Letouzey, Man. Bot. For. Afr. Trop. 2 (B): 362. 1972; McIntyre, Nat. Geogr. 142: 485. 1972; Mitra, Journ. Bomb. Nat. Hist. Soc. 69: 18 & 23. 1972; Mold., Phytologia 23: 422, 423, & 426. 1972; J. W. Parham, Pl. Fiji Isls., ed. 2, 299. 1972; Parkinson, For. Fl. Andam. Isls., imp. 2, 219. 1972; Rouleau, Taxon Ind. 1: 163. 1972; Stainton, For. Nepal 77. 1972; R. R. Stewart, Annot. Cat in Nair & Ali, Fl. West Pakist. 606. 1972; Anon., Biol. Abstr. 55 (11): B.A.S.I.C. S.106 (1973) and 56 (4): B.A.S.I.C. S.109. 1973; Anon., Bull. Gov. For. Exp. Sta. Meguro Tokyo 254: 60. 1973; "J.J.B.", Biol. Abstr. 55: 6071. 1973; Chaturvedi, Indian For. Rec. 12 (12): 1--7. 1973; Farnsworth, Pharmacog. Titles 6, Cum. Gen. Ind. [56]. (1973) and 8 (11): vi & 857. 1973; Govindachari, Parthas., & Desai, Biol. Abstr. 56: 2236. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. 21]: 662--664, 671, 676, & 679. 1973; Mold., Phytologia 25: 232 & 240 (1973) and 26: 368. 1973; Onwelluzo, Fed. Dept. For. Res. Ibadan Res. Paper 20: 1--6. 1973; Rao, Stud. Flow. Pl. Mysore Dist. [thesis] 2: 750--751. 1973; Rao & Razi, Journ. Mysore Univ. B.26: 195. 1973; Wedge, Pl. Names, ed. 1, 18. 1973; Anon., Indian For. 100 (5): A.47. 1974; L. H. & E. Z. Bailey, Hortus Sec., imp. 18, 332. 1974; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 715. 1974; Farnsworth, Pharmacog. Titles 9 (3): x (1974), 9 (4): iv (1974), 9 (5): iv (1974), and 9 (8): iv & 643. 1974; Gibbs, Chemotax. Flow. Pl. 1: 676 (1974) and 3: 1752--1755 & 2136. 1974; Lasser, Braun, & Steyerm., Act. Bot. Venez. 9: 36. 1974; López-Palacios, Pittieria 6: 13--16, map 1. 1974; Mani, Ecol. Biogeogr. India [Illies, Monog. Biol. 23:] 185, 198, 209, 210, & 744. 1974; Mold., Phytologia 28: 443 & 449. 1974; Napp-Zinn, Anat. Blatt A (1): 418--419. 1974; Ramachandra, Row, & al., Chem. Commun. [12]: 476--477. 1974; Sterno & Roche, Ecol. Stud. 6: 262. 1974; Wedge, Pl. Names, ed. 2, 24. 1974; Basu, Indian Med. Pl., imp. 3, pl. 739. 1975; Das, Indian For. 101: 556. 1975; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [53]. 1975; Jaeger & Mold., Phytologia 30: 389 & 403. 1975; Jiménez, Anuar. Acad. Cienc. Rep. Dom. 1: 127. 1975; Kirtikar & Basu, Indian Med. Pl. ed. 2, imp. 2, 3: 1932--1934, pl. 739. 1975; Kooiman, Act. Bot. Neerl. 24: 462. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 27--29. 1975; Mold., Phytologia 31: 391, 398, & 406. 1975; Molina R., Ceiba 19: 96. 1975; Ojo, Res. Pap. (Savan. Ser.) Fed. Dept. For. Res. Nigeria 35: 551.. 1975; Roth, Nov. Pl. Sp., imp. 2, 287--288. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Anon., Biol. Abstr. 61: ACL: 619. 1976; Anon., For. Abstr. 37: 551 (1976) and 37(10): 6. 1976; Anon., Courier-News [Plainfield, N. J.] November 1, C.1. 1976; L. H. & E. Z. Bailey, Hortus Third 515--516. 1976; Mold., Phytologia 34: 263, 265, 269, & 274. 1976; Srivastava, Fl. Gorak. 255. 1976; Talbot, For. Fl. Bomb., ed. 2, 2: 348--350, fig. 451. 1976; Anjaneyulu, M. & K. Rao, Row, Pelter, & Ward, Biol. Abstr. 64: 459. 1977; Anjaneyulu, M. & K. Rao, Row, Pelter, & Ward, Tetrahed. 33: 133--144. 1977; Babu, Herb. Fl. Dehra Dun

15. 1977; Gaussen, Legris, Maher-Homji, Fontale, Pascal, Chandrah., Delacourt, & Troy, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 14: 46, 47, 52, 59, 61, & 84. 1977; Gonzalez Meza, Milit. Advis. Group (MAG) Direc. Gen. For. San Jose 1--27. 1977; Jiménez & Liogier, Moscosoa 1 (2): 14. 1977; Joshi, Singh, & Pardasani, Pl. Med. 32: 71--75. 1977; López-Palacios, Fl. Venez. Verb. 317--320, 649, & 652, fig. 76. 1977; McIntyre, Natl. Geogr. 152: 714 & 715. 1977; Meher-Homji, Feddes Repert. Spec. Nov. 88: 119. 1977; Mold., Phytologia 36: 38. 1977; Subramanian & Kalyani, Indian For. 103: 113 & 117. 1977; Joshi, Singh, & Pardasani, Biol. Abstr. 65: 1622. 1978; Kowal & Kas-sam, Agric. Ecol. Savan. 237. 1978; Meher-Homji, Fontanel, Pascal, Chandrahasan, & Delacourt, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors 15: [Cart. Internat. Tap. Veg. Allhab.] 47 & 63. 1978; Muchovej, Albuquerque, & Ribeiro, Pl. Dis. Rep. 62: 717--719. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 52. 1978; Odebiyi & Sofowore, Lloydia 41: 245. 1978; Sharma, Shetty, Vivekan, & Rathakr., Journ. Bomp. Nat. Hist. Soc. 75: 33. 1978; Akachuku & Burley, IAWA Bull. 1979: 94--99. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24. 1979; Muchovej, Albuquerque, & Ribeiro, Biol. Abstr. 67: 1754. 1979; Villegas & Coto R., Bibliog. For. Am. Trop. 114. 1979; Liu & Yu, Act. Bot. Yunnan 2: 457. 1980; McIntyre, Natl. Geogr. 157: 695, 696, 698, 699, 701, 704, & 705. 1980; Mold., Phytol. Mem. 2: 205, 227, 256--258, 262, 263, 267, 268, 270, 273, 274, 279, 286, 289, 290, 293, 296, 315, 354, 394, 405, 408, 409, 432, & 549. 1980; Ojeniyi & Agbede, Turrialba 30: 268--271 & 290--293. 1980; Raman & Das, Indian For. 106: 622. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980; Arseculeratne, Gunatilaka, & Panabokke, Journ. Ethnopharm. 4: 166. 1981; Deb, Fl. Tripura 1: 16. 1981; Sharma, Shetty, Vivekan., & Rathakr., Journ. Bomb. Nat. Hist. Soc. 75: 33. 1981; Whitmore in Hora, Oxford Encycl. Trees World 263 & 265. 1981; Baas, New Persp. Wood Anat. 154 & 158. 1982; Beishya & Rao, Florist. Stud. Meghalaya 1: 8. 1982; KanjilaL, Das, Kanjilal, & De, Fl. Assam, imp. 2, 3: 466--467. 1982; Liogier & Martorell, Fl. Puerto Rico 152 & 318. 1982; López-Palacios, Revist. Fac. Farm. Univ. Andes 22: 18 & 51. 1982; Mold., Phytologia 50: 251 & 255. 1982; Nayar & Debnath, Journ. Econ. Tax. Bot. 3: 835. 1982; Badillo, Schnee, & Rojas, Ernstia 14: [Clav. Fam. Pl. Sup. Venez., ed. 6] 223. 1983; Mold., Phytologia 54: 238, 240, & 243. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 389--394. 1983; Raj, Rev. Palaeobot. Palyn. 39: 356, 372, & 395. 1983; Storey, Natl. Geogr. 163: 30 & [39]. 1983; Guna Bakshi, Fl. Murashidabad Dist. 252. 1984; Mold., Phytologia 55: 329, 330, 334, 335, & 337--342. 1984.

Illustrations: Rheede, Hort. Malab. 1: pl. 41. 1678; N. L. Burm., Fl. Indica pl. 39. 1768; Gaertn., Fruct. Sem. Pl. 1: pl. 56, fig. 5. 1788; Roxb., Pl. Coast Coromand. 3: pl. 246. 1815; Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 3: pl. 542. 1819; Hook., Curtis Bot. Mag. 74 [ser. 3, 4]: pl. 4395. 1848; Wight, Icon. Pl. Ind. Orient. 4 (3): pl. 1470 (in color). 1849; W. Griff., Icon. Pl. Asiat. 4: pl. 443. 1854; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 2: pl. 14, fig. 1--11. 1862; Bocq., Rév. Verbenac. pl. 14, fig. 1--11. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a):

165, fig. 62 H & J. 1895; Talbot, For. Fl. Bomb., ed. 1, 2: 349, fig. 451. 1909; Basu, Indian Med. Pl., ed. 1, 3: pl. 739. 1918; Dawkins, Indian For. 45: 505 & 518, pl. 27 & 28. 1919; Bose, Man. Indian Bot. 253, fig. 219. 1920; Smythies, Indian For. Rec. 7: pl. 12. 1920; Troup, Silvicult. Indian Trees 2: 270/271, 272, & 272/273, fig. 294--297. 1921; Colthurst, Familiar Flow. Trees India 120. 1924; Chaudhuri, Indian For. 51: 60, pl. 3(3). 1925; Normand, Rev. Internat. Bot. Appliq. Agric. Trop. 11: [171]. pl. 3. 1931; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: pl. 739. 1935; Alston, Kandy Fl. 64, fig. 345. 1938; V. S. Rao, Journ. Indian Bot. Soc. 31: 308, fig. 50--54. 1952; Sastri, Wealth India 4: 154 & 155, fig. 71 & 72. 1956; Kribs, Comm. For. Woods, ed. 2, 160, fig. 330. 1959; Worthington, Ceyl. Trees 345. 1959; Nair & Rehman, Bull. Bot. Gard. Lucknow 76: 18, pl. 2, fig. 10, & text-fig. 22. 1962; Sandrasegaran, Mal. For. 29: 100, fig. 3. 1966; Kribs, Comm. For. Woods, ed. 3, 160, fig. 330. 1968; Corner & Watanabe, Illust. Guide Trop. Pl. 760. 1969; Hughes & Esan, Trop. Sci. 11: 23/24 & 26, pl. 1, & fig. 1. 1969; Anon., Gov. For. Exp. Sta. Meguro Tokyo 254: 64 & 66, fig. 2 & 3. 1973; Mani, Ecol. Biogeogr. India [Illies, Monog. Biol. 23:] 210. 1974; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: pl. 739. 1975; Talbot, For. Fl. Bomb., ed. 2, 2: 349, fig. 451. 1976; López-Palacios, Fl. Venez. Verb. [319], fig. 76. 1977; McIntyre, Natl. Geogr. 152: 714. 1977.

A medium-sized to large, unbuttressed, deciduous tree, to 20 m. tall, wide-spreading (in the open), with a good canopy, rapid-growing, often branched to the base when young easily grown from seed, the young parts densely tomentose; trunk straight or rather irregular, cylindric, to 2.5 m. girth, the bole clear to 10 m. on old trees, usually with 3 or 4 rings per inch of radius; bark smooth or warty, with lenticular tubercles, dark-gray, pale-ashy, or light-gray to grayish-white, grayish-yellow, brownish-white, or white, with blackish patches and conspicuous circular lenticels, rather corky, exfoliating in thick, irregular, woody plates which leave shallow depressions, or in scurfy lighter-colored flakes or scales when old, the blaze pale-orange, freely mottled with darker orange; inner bark mottled yellow, rapidly turning brown on exposure to air; wood light, weight 28--40 (or 50 when wet) pounds per cubic foot, averaging 36 pounds, 13.50 kg. per cubic foot or 600 kg. per cubic meter, very durable, white or grayish to yellowish- or reddish-white or even light yellowish-brown when fresh, coarse-textured, closely even-grained, soft, strong, tough, with a glossy luster, seasoning well without warping or cracking, easily worked, taking a good polish, easily painted or varnished, usually quite resistant to termites and shipworms (*Teredo*), the annual rings more or less distinct, with numerous very fine, prominent, moderately broad and short medullary rays visible in the silver grain as irregular horizontal bands, the pores of different sizes, mostly large in the spring wood, often subdivided, rather prominent in a vertical section, sometimes arranged in rough, more or less concentric lines,, the blaze thick, pale-yellow or white to greenish-white, turning brown, green below the cuticle; branches few (when old) or numerous (when young),

spreading, forming a large shady crown; branchlets and young parts subpubescent to yellowish-tomentose, tetragonal; leaves simple, deciduous, decussate-opposite, mostly rather soft and limp, with an apical drip-tip; petioles cylindric, 4--15 cm. long, puberulent or glabrous, those of a pair often unequal; leaf-blades spinach-green above when young, pale chrome or straw-color when old, subcoriaceous, broadly ovate, 10--25 cm. long, 4--20 cm. wide, apically long-acuminate or caudate, marginally entire on mature plants, basally usually cordate or subcordate to truncate, usually with a short and abrupt central cuneate attenuation into the petiole, densely tomentose above when young, becoming glabrous above when mature, permanently densely fulvous-tomentose or fulvous-tomentellous with stellate hairs beneath, some or all of the leaves with 1--several large glands (nectaries) between the larger veins just above the petiole apex on the basal attenuation; lateral secondaries 5--10 pairs, the lowest pair basal or sub-basal and strong; tertiaries small, more or less parallel; inflorescence racemose, terminal and axillary, strictly dichotomous, fulvous-tomentose throughout, erect, 3--39 cm. long, some with a few single flowers in the leaf-axils; bracts linear or linear-lanceolate to subulate, 3--10 mm. long and 1--2.5 mm. wide, apically acuminate, caducous, neither foliaceous nor brightly colored, densely villous on both surfaces; pedicels 1.5--3 mm. long; flowers large, handsome, appearing before or with the young leaves, about 3.8 cm. long and 2.5 cm. wide, arranged in 1--3-flowered [usually 1-flowered by reduction] cymules on the decussate-opposite panicle-branches, ornithophilous; calyx broadly campanulate, 3--5 mm. long, externally densely appressed-pubescent or fulvous-tomentose, with 1--4 discoid nectariferous glands, the rim with 5 small, triangular, apically acute teeth, internally glabrous; corolla large and showy, 3--4 times as long as the calyx, somewhat like that of *Catalpa*, varying from yellow or yellow tinged with brown to brilliant orange, reddish- or brownish-yellow, dull yellow-brown, pinkish-brown, orange-yellow, or orange-whitish, often dull-chestnut with a yellow lip and throat, mostly deep tawny-yellow within and paler outside, 2.5--4 cm. long, about 2.5 cm. wide, pentamerous, tubular for the lower 1/3 or 5--6 mm., obliquely ampliate and funnelform (10--12 mm. wide) at the throat, externally velutinous to tomentose or densely appressed-villous, internally with glanduliferous hairs, the tube often madder-purple. deeply divided into 2 oblong, apically obtuse, backwardly curled lips, the upper lip short, often at first straight, 2-lobed with ovate apically rounded lobes 7--10 mm. long, 12--15 mm. wide, the lower lip often lemon-yellow, about as long to twice as long as the often dull orange-pink upper one, 3-lobed, the ovate or shovel-shaped middle lobe much longer and broader than the 2 obovate, rounded, 15 mm. long middle ones, broadly rounded, about 15 mm. long and 20--25 mm. wide, often yellow and ribbed on the upper surface, pale on the lower surface, projecting forward (antrorse), apically subobtuse and with an irregularly crenulate margin; stamens 4, didynamous, exserted from the mouth of the corolla-tube, sometimes one pair sterile, 13--15 and 17--20 mm. long; anthers oblong, 2.5--3 mm. long, the 2 thecae parallel and separate; pollen grains 3-zoni-

colporate, prolate spheroidal, 29 x 35 μ (range 33--44 x 32--39 μ), the colpi ends acute, tenuimarginate, the membrane minutely crustate, the apocolpium diameter 3.5 μ , the endocolpium very faint, the exine 1.4 μ thick, the ectine almost as thick as the endine, its surface reticulate, the lumina very small; pistil exerted from the mouth of the corolla-tube; style slender or filiform, glabrous; stigma shortly bifid; ovary 4-celled, externally glabrous, each cell 1-ovulate, the ovules attached near the top of the cell; fruit drupaceous, ovate to oblong or obovoid-pyriform to subrotund, 2--3 cm. long, 1.5--2 cm. wide, borne on the mostly unenlarged fruiting-calyx, at first green but yellow or yellow-orange when mature, succulent, aromatic, bitter-sweet, resembling that of *Spondias*, the pericarp leathery and shiny, the exocarp succulent and sweetish, the endocarp bony, usually 2-celled and (by abortion) 1- or 2-seeded, sometimes 3-celled and 3-seeded; seeds exalbuminous; chromosome number: $2n = 36, 38, \text{ or } 40$.

This species is based on an unnumbered Rottler collection probably now deposited in the East India Company herbarium at Kew, originally from the Coromandel coast of India.

Smith's original description is: "*G. arborea*. Roxb. MSS. (*Cumbulu*; Rheede Hort. Mal. v. 1. 75. t. 41) -- Leaves heart-shaped, undivided, pointed, downy beneath; their lateral ribs cloven. Thorns none. -- Sent from the coast of Coromandel by the Rev. Dr. Rottler, with the above name of Dr. Roxburgh. Gaertner has most justly pointed out the *Cumbulu* of Rheede as a *Gmelina*, though quoted by Linnaeus, doubtfully indeed, for his *Bignonia Catalpa*. This is a tall and upright tree, growing in sandy ground, with downy branches, and large, opposite, stalked, heart-shaped, entire leaves, downy and veiny beneath. Thorns none, as far as we can learn. -- The flowers are numerous and handsome, yellow, growing in compound, hairy, terminal clusters. Fruit yellow, obovate, rather small."

The species is native from Pakistan, Bhutan, India, and Sri Lanka, east through Bangladesh, Burma, and Thailand to Indochina, Malaya, and Indonesia, and north to southern China. It has been introduced for shade, fuel, timber, and paper-pulp in several parts of tropical Africa [Ghana, Nigeria, Sierra Leone, Malawi, Tanzania, Uganda, Zimbabwe, and South Africa] and South America [Brazil and Venezuela], often in extensive plantations from which it tends to escape and become naturalized; also in lesser quantity in Central America and the West Indies [Mexico, Belize, Honduras, Cuba, Puerto Rico, and Dominica] and the oceanic islands [Fiji, Hawaii, and the Philippines]. In India it is sometimes planted along avenues for shade and as an ornamental or decorative tree in parks and gardens. In Sri Lanka my wife and I saw it being used for shade in temple gardens.

Collectors describe the tree as varying from shrubby to large, 5--15 m. tall or 20--60 feet tall, the trunk 15--36 inches in diameter at breast height and 61 inches in girth, often branched from the base (when young), the crown rounded, the bark 1 cm. thick, varying from gray or grayish to yellowish or yellowish-gray or even brown, tuberculate-roughened, finely fissured, the cut surface yel-

low and brown streaked, the wood "fading yellow", the leaves opposite, green, deciduous, hairy beneath and with nectaries at the base, the flowers fragrant or slightly so, the stamens "2 plus 2", and the fruit at first green, then yellow, finally light-brown, bitter-sweet, "cherished by antelopes". Collectors have encountered it at altitudes of 50 to 1650 meters, in anthesis from August to May and in fruit in February, from April to July, and in October. They have found it growing in fields and hedges, along roadsides, in open ground and on flat land, in jungles, deciduous and open deciduous forests, subtropical evergreen forests, on hill slopes, sandstone ridges, and steep disturbed mountainsides, in dry bamboo brakes, along streamides, and in *patana* grassland, in the light shade of forest edges (but not in deep shade), in scrub jungles, on savannas, and in areas of 87--95 inches of rainfall per year.

The corollas are described as "yellow" on Henry 12886, Koyama & al. 15535, Saldanha 12346 & 13298, Sangdhachand 780, Sumithraarachchi & Fernando DBS.161, and Wendt & al. 2916, "madder-purple, yellow in throat and lip" on Chand 4398, "yellow to brown" on Saldanha 16581, "brownish-yellow" on Molina R. 27891 and Saldanha 12824, "dull yellow-brown" on Nafday 174, "yellow and brown" on Bailey 809, "yellow and pinkish" on Phillips 2773, "yellowish-brown" on Kokkam Kaeng 4, "reddish-yellow" on Kadir s.n., "brown with yellow lower lip, throat purple" on Sumithraarachchi DBS.663, "yellow with brownish petal-tips" on Gentry 12805, "yellow, pink outside, hood and edge of wings also pink" on Chand 7476, "lip broadly yellow-edged" on Chand 3045, "brown, yellow in tube, mouth tinted purple, lip bright-yellow" on Stevens 20955, "whitish-yellow with brown" on Bunpheng 1080, "madder purple, lip and bowl yellow" on Koelz 33086, "pinkish-brown, lip and tongue yellow" on Chand 8344, "clouded rose-purple, lip yellow" on Chand 1443, "crimson, lip yellow" on Chand 4603, and "purplish-red, yellow-pubescent inside, tube and labellum yellow inside" on Kanis & al. SAN.52638, while Mejía 253 is said to have had the "flores amarillas por dentro y rojo claro por fuera".

Bunphang reports the species common in evergreen forests in Thailand and Sangkhachand found it common in lowland evergreen forests there; Ward tells us that it is "common but scattered in subtropical evergreen forests, leafless or almost so when in full bloom" in Burma in April. Saldanha reports it "common in deciduous forests, occasional in semi-evergreen forests" in Mysore, India. Sumithraarachchi avers it to be "rare on hilltop savannas" in Sri Lanka; Kokkam Kaeng describes it as a large tree "common in dry mixed deciduous forests" in Thailand. My wife and I found it occurring as scattered trees on steep forested slopes in Sri Lanka. Saldanha refers to it both as "occasional" and as "fairly common" in Mysore.

The *Premna tomentosa* of Miquel, referred to in the synonymy (above), is based on Hohenacker 554 from Kerala, India. The homonymous *Gmelina tomentosa* Roxb. is a synonym of *G. asiatica* L. and *G. tomentosa* Fletcher is a valid species.

Gmelina arborea is of considerable economic importance and has accumulated a large literature. Brandis (1874) calls it "A widely spread tree through the greater part of India, Burma and Ceylon. In

the sub-Himalayan tract it extends to the Chenab, ascending to 3,000 feet and even higher, but is scarce in the Panjab. Grows on the dry hills of the Aravalli range near Ajmir. Not gregarious, and nowhere abundant. The leaves are shed Feb.--April, the new foliage appears April--May. Fl. generally before the leaves, Feb.--April. Fruit ripens May--June."

Kurz (1877) says that the tree is "Frequent all over Burma from Ava and Chittagong down to Tenasserim and the Andamans, especially in the upper mixed forests and also in the tropical forests, but rarely entering alluvium, up to 3,000 feet elevation." In his 1875 work he lists it from the upper mixed forests and evergreen tropical forests of Pegu, describing the wood as white, light, "resembling mutchi wood", weighing 35 pounds per cubic foot, "used [in Pegu] often for making canoes and boats, also for house-posts, planks, clogs and for carving images. Recommended for furniture." Deb (1981) lists it from Tripura.

Schauer (1847) cites unnumbered collections of Edgeworth, of Roxburgh, and of Perrottet, as well as *Wallich 1817* in the DeCandolle Herbarium at Geneva, all from eastern India. Trimen (1895) tells us that in Sri Lanka it is found in the "Moist region up to 5000 ft.; rather common, but often cultivated. Fl. March; 4 upper lobes dull orange-pink, lower one lemon-yellow.....The flowers suggest a Bigoniaceous plant. They appear along with the young foliage, the tree being deciduous."

Talbot (1909) says that the species occurs in "Tropical and sub-tropical India up to 5000' in deciduous forests, Burmah, Bengal, Chittagong, moist region of Ceylon; throughout the [Bombay; Presidency scattered in monsoon-forest but nowhere common, on the Turanmal plateau Khandesh Satpudas, 3700'", flowering there in March and April, fruiting in May and June.

Hallier (1918) cites his nos. C.243 and 3514 from Sri Lanka and *Hosseus 476* from Thailand. Parkinson (1922) lists the species from the "upper mixed forests", citing an unnumbered Kurz collection, but adds that "The Andaman specimens have been collected only in Port Blair where it may have been introduced and planted. I do not think it is a native of the [Andaman] islands." Parker (1924) lists it from the Punjab as "Not common" in the sub-Himalayan area from Ravi eastward, but "Often cultivated in the plains".

P'ei (1932) cites from Yunnan, China, only *A. Henry 12886*. He notes that "The Yunnan plant agrees very well with the Indian material except that its leaves are not as large as described by Roxburgh. It is allied to *Gmelina asiatica* L., from which it differs by its erect inflorescences, and large leaves."

White (1962) refers to trial plots planted in Zambia. Dop (1935) cites unnumbered collections by Chevalier from Tonkin, by Harmand and by Poilane from Annam, by Harmand and by Thorel from Laos, and by Hosseus and by Kerr from Thailand.

Haines (1910) describes the bark as "light grey, sometimes lightly and transversely furrowed, flaky in isolated light coloured patches when old, thick. Blaze with a thin chlorophyll layer, then thick pale yellow with rough cut, then white with soft cut. Inside

(on wood) yellowish."

Lamb (1968) gives a detailed discussion of this species as to description, flowering and fruiting, leaf-fall, root system, habitat conditions in relation to climate, physiography and ecologic associations, longevity and growth patterns, seed production and quality, seed distribution, causes of damage to seeds, natural and artificial regeneration, seed germination, seedling characters, recommended methods of sowing, nursery care, preparation of plantation sites, planting and tending of seedlings, spacing, nutrient requirements, thinning and pruning, growth rate, yield, parasites, pests, fungal diseases, frost, fire, and wind damage, physical and mechanical properties of the wood (including macroscopic and microscopic features), seasoning and shrinkage, durability, preservation treatment, etc. According to him "The bark on young trees and on the crown and upper part of the stem in older trees, is smooth, corky pale brown to grey in colour. It exfoliates near the swollen base of the stems in trees over five to eight years old exposing smooth paler coloured bark beneath. Form varies greatly with varying conditions of growth. If grown in the open, heavy branches and a wide crown develop and the stem is short, seldom straight, swollen at ground level and markedly tapered; if grown in well thinned plantations on high quality sites, the tree attains a height of 100 feet in 20 years, a girth of 6 to 8 feet at breast height, a clean nearly straight stem, with much less taper and a domed crown. Trees of this form have been reported in natural forest in Burma.....The leaves fall as a rule about January--February in its natural habitat; the new leaves appear in March--April. The panicles of flowers appear from February to April when the tree is more or less leafless, or with the young leaves.....The root system varies in depth of penetration with soil depth and texture. Roots have the same pale corky bark at the ground surface as the branches." It is "a short lived tree everywhere but lives longer and grows larger where deep moist soil amply supplied with moisture occurs." It is "a transitory species in rain forest springing up where a hole occurs in the canopy and growing rapidly on the accumulated fertility occurring in such gaps. It will grow equally well in deciduous high forest on the deep river alluvia." It will start to grow on dry, shallow, sandy, or otherwise poor soil, but will remain stunted. "It is sensitive under these conditions to competition from weed species, especially grasses, and fails to suppress them; the leaves turn yellow, the canopy lightens and tree growth slows down. However, in savanna woodland and on sites of abandoned villages and old cattle kraals in Africa, the stimulus from the residue of nutrients in the soil causes vigorous growth, a dense closed canopy and clean forest floor, and produces stems useful for poles."

In the mixed deciduous forests of the Central Provinces of India it grows in association with *Tectona grandis*, *Terminalia tomentosa*, *T. belerica*, *Lagerstroemia parviflora*, *Ougeinia dalbergioides*, *Anogeissus latifolia*, *Dalbergia sissoo*, *D. paniculata*, *Pterocarpus marsupium*, *Diospyros melanoxylon*, *Acacia catechu*, *Chloroxylon scietenia*, *Soymida febrifuga*, *Schleichera trijuga*, *Schrebera swie-*

tenioides, *Cleistanthus collinus*, *Odina wodier*, *Cassia fistula*, *Bridelia retusa*, *Adina cordifolia*, *Stephegyne parvifolia*, *Butia frondosa*, *Bassia latifolia*, *Phyllanthus emblica*, *Buchanania latifolia*, *Xylia xylocarpa*, and the prevailing bamboos, *Dendrocalamus strictus* and *Bambusa arundinacea* (along rivers).

Lamb avers that *Gmelina arborea* "grows very rapidly during the first six years of its life with the production of heavy branches when the trees are widely separated and a very tapered bole. With competition from neighbours the branches are kept small and the taper of the stems is greatly reduced. By the seventh year rapid height growth slows down." In unfavorable sites it may die in its twelfth year even without attack from a primary pathogen, "but in the best alluvial sites in a monsoon climate it may live to be at least 30 or 40 years of age. It is however a short lived tree."

Trees as young as 3 or 4 years may produce fruit, ripening from the end of April (in Burma) to July (in India) and "fruiting is regular and usually plentiful each year.....about 640.....per pound." The rate of germination of fresh seeds is high, but decreases rapidly in storage.

"On sandy soils in the open, around *Gmelina* plantations in Eastern Nigeria and Sierra Leone, natural regeneration is prolific....The seed will germinate under the thinned out canopy of a [suddenly destroyed] plantation". Germination is epigeous, resembling that of Teak. The stone of the drupe opens by means of one or two lateral valves, the radicle emerging first, the cotyledons issuing shortly after. The stone is either left on the ground, or is carried up over the cotyledons, falling with their expansion."

Streets (1962) describes efforts to introduce *Gmelina arborea* into various parts of the British Commonwealth, with only varying degrees of success. In some areas, however, it has produced an average growth of 50 feet and a diameter of 6.4 inches in 21 years, with 450 trees per acre; in other areas an average of 45 feet in 10 years with a rapid suppression of weedy undergrowth. It coppices well.

Prain (1963) lists the species from Chota Nagpur, central and western Bengal, and Chittagong. Kanjilal and his associates (1939) assert that it is "common" throughout Assam. Cooke (1958) cites unnumbered collections by Dalzell & Gibson from Konkan, by Woodrow from Deccan, by Ritchie and by Talbot from Kanara, and by Woodrow from Gujarat. He also cites a Dalzell & Gibson collection from Sind, but admits that it was from "introduced" material. He gives the species' overall distribution as throughout India, Ceylon, and the Malayan [and, erroneously, the Philippine] islands. Parham (1964) reports it introduced and moderately common in the Fiji islands.

Gamble (1902) tells us that "This handsome and useful tree is to be found throughout India, except in very dry localities, but is never gregarious and nowhere very common. In the Lower Himalaya and Sub-Himalaya it is met with in the moister parts of the Sál and mixed forests, and in similar places in the C[entral] P[rovinces], Berer, Bombay and South India. It is most common in Eastern Bengal and

Chittagong [in Bangladesh], and also in Burma. It is often planted as a garden tree and in avenues, and seedlings grow very fast in suitable soil. It coppices very well. It has large yellow flowers and a large fleshy drupe." Graham (1839) lists it from Bombay island, India, and assures us that it is "Common throughout the Concans". Dastur (1952) describes the species as "Scattered over a large part of Tropical and Subtropical India and Pakistan, up to 5,000 ft. in deciduous forests". The wood "is one of the best and most reliable timbers; it can easily be painted and varnished."

Hains (1922) avers that the typical form of *G. arborea*, with its stellate pubescence on the lower leaf-surface, is found "only....in the extreme north of the province [Bihar & Orissa], if at all." Barnard (1955) discusses in detail the general problems involved in attempts to use this tree in afforestation or reforestation projects in Malaya.

Srivastava (1967) informs us that the species is called "vidari" and "vidarini" in the ancient Charak Samhita, but is now called "gambhari" and "kasmari" in the Ayurvedic materia medica of India. In his later (1976) work he cites his no. 1293, noting that the tree is "Frequent in and around the forest. Most of the flowers fall off even before pollination [and so] only a few fruits develop."

Menninger (1944) says of *Gmelina arborea*: "This is a charming tree of shady localities and the lower hills throughout India. Ida Colthurst in 'Familiar Trees in India' says: 'Nature, always imitable in her choice of harmonizing colors, perhaps nowhere excels herself as when she blends yellow and browns; and a good example of this art is the exquisitely scented bloom of *Gmelina*. The flower appear on a naked tree, from the end of February right on to mid-April, and in shape bear some resemblance to *Antirrhinum* (Snapdragon). They have five petals, four of which are tawny, and the fifth a bright yellow which in the bud is bent inwards and protects the dark ones. The leaves, broad (6 x 9 inches), are heart shaped and ending in a point, appear as soon as the season of blooming is over.' The leaves are dark green and glossy on the upper surface, pale green underneath. Sturrock says it is a handsome, unarmed tree requiring rich soil. Corner's 'Wayside Trees of Malaya' calls the flowers 'orange yellow', says they are often in clusters a foot long at the tips of the branches and from the leaf axils. The tree, usually 50 to 60 feet, grows much larger in Burma and is valued for its timber because it 'lasts well under water, better than teak'." In a later work (1962) he asserts that in Florida (U.S.A.) the tree can withstand winter temperatures as low as 20° F., its blossoms, appearing when the foliage is thin or absent, "put on a good show", and mature specimens are growing in Ocala, Fort Myers, and Stuart, Florida.

Ali (1932) reports that the flowers appear to be well adapted to bird-pollination and are mostly serviced by the sunbirds, *Leptocoma asiatica* and *L. zeylonica*, throughout daylight hours.

Cave (1964) records the haploid chromosome number as 19, but S. & G. Mangenot (1962) give the diploid number as 36, while Raman & Keszvan (1963) give it as 38. Possibly different varieties of the

species were used in obtaining these diverse figures. Hopefully, herbarium vouchers were made and are preserved somewhere so that the exact identification can be checked!

Joseph & Vajravelu (1967) cite their no. 14005; Kammathy (1967) cites his nos. 73667, 79893, 80056, & 80207, referring to the species as "common in moist deciduous forests dominated by *Terminalia tomentosa*, where it is mostly overtopped by *Wendlandia thyrsoides*". Santapau & Raizada (1955) call it a rare tree (in the wild) in the Gir of India, but note that "we have seen.....a fairly large number under cultivation in forest nurseries", citing four unnumbered collections, one of which was labeled as "common in field hedges". Saxena (1970) cites only Saxena & Khotele 5908.

Venkatareddi (1969) describes the tree as only "occasional in deciduous forests" and cites his nos. 96045, 97700, & 100973 and Gamme 15168. Vyas (1964) reports it "common in the luxuriant growth of cool and shady valleys in the Sub-Himalayan areas", while Agarwal (1970) also lists it from the Sub-Himalayan tract from Chenab eastward and "throughout India, Burma and Andamans". Ellis (1968) cites his no. 23736 from Andhra Pradesh, where Sebastine & Henry (1966) found it to be "rare along roadside", citing only their 15958. Rao & Rabha (1966) list it from Assam.

Longman (1969) reports that, in his experience, night temperatures of 26° C. will lead to bud dormancy in some individual trees, but not in all.

Puri (1960) found *Gmelina arborea* to occur naturally in the second story in north Indian lower alluvial savanna forests in Bengal along with *Bombax malabaricum*, *Callicarpa arborea*, etc.. and asserts that it follows a phytogeographic pattern of nearly uniform distribution throughout India except for the desert area. In the northern sub-Himalayan tropical semi-evergreen forest on lower hillslopes it is one of the common associates of teak (*Tectona grandis*). It occurs in the sandalwood tropical moist deciduous forests in Mysore, Madras, Bombay, and parts of Madhya Pradesh in association with *Artocarpus hirsuta*, *Eugenia jambolana*, *Vitex negundo*, etc. It occurs in the upper story with *Bombax malabaricum* in edaphic, Gangetic, tropical, moist, deciduous, riverine forests in the sub-Himalayan areas of Uttar Pradesh along with *Callicarpa macrophylla* in the third story and with *Cassia fistula*, *Randia longispina*, *Zizyphus jujuba*, etc. in the second story. It is found in the first story in savanna forests in the north Indian lower alluvial areas with *Callicarpa arborea* in the second story, as well as in moist deciduous and evergreen mixed forests and on wet savannas in the *Erianthus ravennae* association. He claims that it shows "great sensitivity to frost owing to having large leaves with buds, leaves and internodes possessing hairy, warty or rough surfaces". The species is a strong light demander like teak. Its foliage is gathered and considered good cattle fodder in Madhya, Vidya, and Uttar Pradesh.

Subramanian & Kalyani (1977) declare that *G. arborea* is associated in the so-called southern tropical dry deciduous forests, at an altitude of 600--1100 m., on flat or undulating land and on the lower hillslopes where the annual rainfall is generally between 80 and 100

cm., with *Anogeissus latifolia*, *Albizzia odoratissima*, *A. amara*, *A. lebbek*, *Amaranthus spinosus*, *Asystasia dalzelliana*, *Azima tetra-cantha*, *Buchanania lanzan*, *Butea monosperma*, *Chloroxylon swietenia*, *Cochlosperma religiosum*, *Commiphora caudata*, *Canthium dicoccum*, *Cordia dichotoma*, *Celtis cinnamomea*, *Cipadessa baccifera*, *Crassocephalum crepidioides*, *Coleus forskholii*, *Croton bonplandianum*, *Diospyros montana*, *Donichandrone falcata*, *Dodonaea viscosa*, *Elaeodendron roxburghii*, *Ehretia ovalifolia*, *Embllica offisinalis*, *Euphorbia hirta*, *Grewia abutifolia*, *G. flavescens*, *Indigofera cassioides*, *Leucas hirta*, *Ligustrum roxburghii*, *Maytenus ovatus*, *Olea glandulifera*, *Pittosporum floribundum*, *Premna latifolia*, *Radermachera xylocarpa*, *Santalum album*, *Salvadora persica*, *Soymida febrifuga*, *Sapindus emarginatus*, *Scutia circumscissa*, *Trichodesma indicum*, *Terminalia chebula*, *T. crenulata*, *Tridax procumbens*, *Vitex altissima*, *Vernonia divergens*, and *Wendlandia thyrsoides*.

Benthall (1933) asserts that "The tree is indigenous in most parts of the plains of India and Burma, but is nowhere abundant. It is not wild in Lower Bengal, but is occasionally planted [there] in gardens and villages, and on roadsides.....In Calcutta the new leaves appear in February and March, but in drier climates this takes place later in the year. The flowers appear from February to April, often before the new leaves are open. The tree is bare of leaves for a short time, but the first flowers often appear before the old leaves have fallen. The fruits ripen from April to June. When not in flower the tree closely resembles *Trewia nudiflora* Linn., but the latter may be distinguished by the raised line that joins the bases of each pair of opposite leaf-stalks."

Caaudhuri (1969) encountered *Gmelina arborea* in the so-called "block forests" (which are clear-felled areas of dry mixed forests) in northern Bengal, while Mukerjee (1965) lists it as an invading pioneer tree on the savannas of West Bengal. Palit (1969) reports that it often grows in association with *Shorea robusta* in that same state of India. Deb and his associates (1968) list it from Bhutan.

Cooke (1905) cites unnumbered collections of Dalzell & Gibson, of Ritchie, and of Woodrow from Bombay and declares that the species has been introduced in Sind, Pakistan. He also says that "The root, the bark, and the fruit are used medicinally; the fruit is also eaten by some of the hill-tribes. The timber is excellent, strong and light, does not warp nor shrink, and is valuable for ornamental work."

Brandis (1906) gives its natural distribution as the "Subhimalayan tract from the Chenab eastwards to 3,000 ft. Aravalli hills. Central India. Singbhum. Western Peninsula. Burma." He notes also that the leaves are shed from February to early April and the new foliage appears from late April to May; the flowers appear from February to April, generally before the leaves are fully developed. He also agrees that the species coppices well. Nairne (1894) asserts that it is less common in the Deccan peninsula than it is in Konkan. Babu (1977) tells us that it is a common tree in ravines and on slopes in the monsoon forest of Dehra Dun. Santapau & Rai-zada (1956) refer to it as "a rare tree in the Gir in the wild state;

we have seen a few plants growing wild, but a fairly large number under cultivation in forest nurseries." They cite four unnumbered collections -- for one of which they note "common in field hedges". Inamdar (1968, 1971), Shah (1969), Jain (1963), Patel (1971) and Santapau (1955) all report it from Gujerat, while Santapau (1967) lists it from Saurashtra. Ellis and his associates (1967) cite their no. 18678 from Kerala; Vajravelu and his associates (1968) refer to it as common in teak and rosewood plantations in the same Indian state, citing Vajravelu 19113.

Subramanyam & Henry (1966) encountered *Gmelina arborea* in mixed deciduous forests at the foot of and on the lower slopes of mountains in Madhya Pradesh, while Rao & Sastry (1964) refer to it as "rare" on exposed hilltops and Joseph (1963) found it "not common" in the same state. Patel (1968) asserts that in Melghat it is "Occasional, but locally frequent at high elevations and in areas cultivated in the past". Deb (1961) cites his no. 2042 from Manipur. Bhatta-charjee & Das (1969) list it from Mysore, where Naithani (1966) refers to it as "rare", citing his no. 23120. Razi (1946) also lists it from Mysore, referring to it as a "mesophanerophyte" in the Raunkiaer classification of life forms. Datta (1965) calls it "a moderate-sized tree of the Orissa jungles", while Vyas (1967) refers to it as a "rare tree of slopes and cool valleys" in Rajasthan, citing his no. 58.

Sharma and his associates (1978, 1981) cite Sharma 39816 from Tamil Nadu where the species is said to be only "occasional"; Deb (1968) records it from Tripura, and Gupta (1967) from Uttar Pradesh. Santapau & Shah (1969) found it growing on Salsette island, and Kurz (1870) lists it from the Andaman Islands. Griffith (1854) records it from Upper Burma, from where Merrill (1941) cites Kingdon Ward 493.

Clarke (1885) maintains that *Gmelina arborea* occurs "Throughout the Deccan Peninsula and Ceylon, frequent, extending to the foot of the N. W. Himalaya" [Pakistan] and Chittagong [Bangladesh]. Jafri & Ghafoor, in a personal communication to me, describe it as a "rare plant in our area" [Pakistan], but "cultivated as a decorator tree in gardens and avenues". They cite only a single Jan Mohamed collection.

From Sri Lanka the species is listed by Gunawardena (1968); Thwaites & Hooker (1861) cite only C.P. 228 (698). Trimen (1895) says of it: "rather common in moist region up to 5000 ft., but often cultivated". Hallier (1918) cites his nos. 3514 & C.243, the latter from cultivated material, but the former from a tree apparently growing wild along the edge of the river adjoining the Sri Lanka Botanical Garden, where, according to observations made by my wife and myself during our visit there, cuttings and trash from the garden are regularly dumped. Hallier also cites Hosseus 476 and gives the species' overall distribution, as recognized by him, as India, Sikkim, Assam, Bangladesh, Malaya, and the Philippines [the Philippine part of this supposed distribution is erroneous]. Craib (1911) cites Kerr 540 and Hosseus 576, the latter as to flowers only, the leaves being those of *Columbia floribunda* Wall. [= *Colona floribunda*].

Fletcher (1938) cites, also from Thailand, Annandale s.n., Hosseus

576, Kerr 540, 2331, 9856, 12356, & 20271 (but the Hosseus collection, again, as to flowers only). He also cites an unnumbered Curtis collection from the Langkawi islands, giving the overall distribution of the species, as accepted by him, as India (type locality), Yunnan, Burma, Indochina, and again erroneously, the Philippine islands. Sawyer & Chermesirivathena (1969) describe it as infrequent in the "phytocenose 1" association, at 310--640 m. altitude, in Thailand.

Dop (1933) cites unnumbered collections by Chevalier, Harmand, Poilane, and Thorel from Annam, Vietnam. He distinguishes *G. arborea* from the closely related *G. racemosa* (Lour.) Merr. as follows: *Gmelina arborea* has the calyx with 5 triangular, apically acute lobes which are 5 mm. long and not glanduliferous, while *G. racemosa* has the calyx truncate and entire, with numerous small vertical glands, the ovary apically pubescent. In *G. arborea* the ovary is externally glabrous.

Corner (1952) reports *G. arborea* as cultivated in Malaya, both as a city tree and by the Forest Service in plantations. Satmoko (1961) lists it as a constituent of the shore vegetation in Java and in the *Barringtonia* formation on the island's sheltered west coast.

Mukherjee & Ghosh (1968) tell us that in India the tree is propagated by seed in the traditional gootee method by the Forest Department. Maheshwari (1918) cites his no. 1031 from Delhi, where, he says, the species is "Planted in the lawns of gardens. Most of the flowers fall off and [therefore] only a few develop fruit. The tree does not thrive well in the area [of Delhi]." Woodrow (1910) affirms that the seed may be treated like that of teak (*Tectona grandis*), "but large cuttings planted in August and September root freely."

Loudon (1830, 1832) and Sweet (1826, 1830) claim that the species was introduced into cultivation in England from the "E. Indies" [actually, eastern India] in 1812. Misra (1969) reports *G. arborea* grown for timber in India, while Stewart (1972) avers that it is cultivated and naturalized in Sind, "often cultivated on the Pakistan plains and wild from Mirpur and Jammu eastward". Prain (1963) lists it from western and central Bengal, Chota Nagpur, and Chittagong; Das (1964) found it in mixed dry forests in West Bengal. Voigt (1845) lists it as cultivated in Calcutta and its suburbs, while Ghosh (1964) reports it cultivated in plantations by the Forest Service in West Bengal. Collett & Hemsley (1890) report it from the Shan States of Burma, citing an unnumbered Aplin collection.

Dawkins (1919) reports that sambar deer (*Rusa unicorn*) are attracted from "the whole countryside" to *Gmelina* plantations, where they can do serious grazing damage, but "curiously enough, cattle seem to be averse to [it]", refusing even to touch it: "in fact, their presence is looked on as beneficial in keeping down weeds and grass. Even in the dry season, when sambar grazing is at its worst, cattle in these forest regions can find plenty to eat, and seem to dislike yemane [*G. arborea*] as much as they do teak. Ponies also refuse it, so there must be something distasteful in it." Hail storms can do much damage to the young shoots, but "most of the trees will recover without coppicing, and several such storms every

year would be preferable to the visitations of sambar." He recommends short-length timber produced by very heavy thinning over 4 or 5 years, with consequent girth enhancement and shortened rotation. He concludes that "there can be no doubt that this tree....must form an exceedingly profitable crop, providing that localities well suited for export are selected, and floating will always be the cheapest extraction method."

Parker (1924) points out that "The tree would be worth cultivation for timber, but it cannot stand frost in irrigated plantations" [in the Punjab, where it is "not common"]. In the mid 1960s Daniel K. Ludwig purchased a 3,000,000-acre tract of virgin rainforest on a tributary of the Amazon river in Brazil on which to grow *Gmelina arborea*. He thought that this tree would produce wood there for pulp and lumber at about ten times the rate of "ordinary" trees. By the end of the "first stage" of this project and the strip-clearing of irreplaceable native vegetation, in 1983, the total cash investment was estimated at about 1 billion dollars. Certainly this is a most grandiose follow-up -- to be deplored from an ecologic viewpoint -- on Parker's modest suggestion in 1924! McIntyre (1972) asserts that those trees that grow straight will have their wood used in cabinet work, the rest for pulp, and that "gmelinas will eventually provide as much as 1,000 tons of pulpwood a day....without exhausting the jungle soils."

Chaudhuri (1925) asserts that in the Chittagong area the tree does not grow with a straight trunk in the wild, but when planted close together in a plantation will grow fast and straight, with an average growth of 51 feet and trunk diameter of 5 inches in 5 years; the largest he observed was 59 feet 5 inches tall, with a diameter at breast height of 7.45 inches. A tree with a 6-foot girth was produced in 30 years. He observes that the tree is often attacked by the beetle, *Calopepla leayana*, which may cause serious damage.

Kowal & Kassam (1978) report that *Gmelina arborea* is an important tree for use in the afforestation of savannas in Nigeria, where it has a very high rate of growth -- "the annual growth increment in Nigeria [being] 16--28 m³/ha." Bojer (1837) listed it as cultivated in Mauritius (in the botanical garden) already in his time. Molina (1975) found it cultivated in Honduras and Roig (1953) in Cuba. Jiménez (1975) lists it as cultivated in the Dominican Republic and asserts that Dr. Basset Maguire introduced it into the United States as a possible source of paper pulp. Liogier & Martorell (1982) comment that it is "scarcely planted and perhaps escaped in Puerto Rico". Lasser and his associates (1974) report it cultivated in Venezuela, while López-Palacios (1977) says that it is actually cultivated in at least four states of that country, although he cites only his no. 3096. In a personal communication he tells me that *Aristeguieta 6933*, in the Caracas herbarium, represents this species and that the tree actually occurs both wild and cultivated in the state of Barinas, Venezuela.

The Baileys (1941, 1976) list the species as hardy in their Life-zone 10, cultivated "along the southern border" of the U.S.A. They list only the Singapore Botanical Garden as a source of the seed in

the horticultural trade. Van Rensselaer (1948) found it in cultivation in California.

Akachuku & Burley (1979) found that individual trees of in plantations varied in fiber length and also in proportion of fiber, vessels, and parenchyma. Yeom & Sandrasegaran (1966) found that the average crown diameter (Kd) and stem diameter (D) are linearly and positively correlated and the correlation may be expressed by this formula: $Kd = 1.15 D + 924$. They also found a curvilinear relationship between Kd and the total height of the tree, as well as a positive correlation between the total height and the stem diameter. The mean average yield in Malaya, as reported by them, is 3700 cu. ft. per acre for 7--9-year old trees.

Foxworthy (1909) describes the wood as "yellowish, grayish, or reddish white, with a glossy luster, evengrained, soft, light and strong, durable, does not warp or crack. Seasonal rings marked either by a white line or by more numerous pores in the spring wood. Pores large and moderate-sized, often subdivided, rather prominent on a vertical section; sometimes arranged in rough, more or less concentric lines. Pith-rays short, moderately broad, prominent. Wood easily worked and readily takes paint or varnish; it is very durable under water."

Hughes & Esan (1969) have investigated the variation in the structural features and properties of the wood as a result of changes in population density. They found density to be strongly correlated (in simple correlation) with fiber length, distance from the pith, and age.

Fox (1967) describes the establishment practices, growth figures, and thinning techniques used in *Gmelina* culture in Sierra Leone. Growth data and preliminary volume tables based on simple plot measurements are discussed and the silvicultural conflict between espacement, loss of increment, and the phenomenon of dieback are described.

Ojenyi & Agbede (1980) have reported on the effect on soil fertility of inter-planting a forest crop of *Gmelina* with food crops in Southern Nigeria. Inter-cropping with yam, maize, and cassava caused no significant change in soil fertility, but a slight reduction in soil organic carbon and increase in soil N and P were observed. No definite change in pH was observed. "The investigation therefore further supports the practise of agri-silviculture [simultaneous production of forest and food crops on the same area of land] as a means of increasing food production in the tropics." When all the food crops were combined on a *Gmelina* plot, the girth and even survival of *Gmelina* after two years were usually relatively low, but the difference in the agronomic performance of *Gmelina* due to intercropping with individual but different food crops were not significant. The yield of food crops grown on *Gmelina* plantations compared favorably with that from unfertilized arable plots planted to the food crops alone.

[to be continued]

AA (ORCHIDACEAE) IN COSTA RICA

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Abstract: Aa paleacea (H.B.K.) Reichb. f. (Orchidaceae) is reported from Central America for the first time.

The genus Aa Reichb. f. is an Andean genus of terrestrial orchids. It has never been reported north of Colombia. It was discovered in the high paramo of Costa Rica in 1962 and has remained unidentified in herbaria since.

AA Reichb. f., Xenia Orchid. 1: 18, 1854. TYPE: Orphys paleacea H.B.K., Nova Gen. Sp. Pl. 1: 334. 1817. fide Baillon, Dict. Bot. 309. 1892.

Erect, terrestrial plants. Roots fleshy. Stems erect. Leaves basal, spiral, conduplicate, petiolate, nonarticulate, the flowering stems usually leafless, enclosed in loose, thin, papery sheaths. Flowers in dense terminal spikes, the bracts thin, papery, usually longer than the flowers, ovary as large as the flower, the flower small, without hairs, the sepals similar, the two uppermost erect and spreading the lowermost pendent; lip uppermost, hooded, the mouth often fringed, the base with a pair of calli the column short, the anther dorsal, the pollinia 4, soft, without caudicles oblong, sessile, the viscidium terminal, the stigma entire.

There are about 30 species of Aa native to the high Andes of South America. Some authors consider this genus to be only a slight variant of the genus Altensteinia H.B.K. The two genera are closely related but Aa can be distinguished by its hooded, fringed lip, glabrous column, and large stigmas.

The name Aa has no meaning, unless it is a shortening of Altensteinia. Schultes and Pease (1963) speculate that it was used to ensure the placement of a Reichenbach name at the head of any list of genera.

Classification (Dressler 1983): subfamily Spiranthoideae, tribe Cranichideae, subtribe Cranichidineae.

Aa paleacea (H.B.K.) Reichb. f., *Xenia Orchid.* 1: 18. 1854.
(fig. 1).

Orphys paleacea H.B.K., *Nova Gen. Sp. Pl.* 1: 334. 1816. Type:
Ecuador, Pichincha, Lloa Chiquito, Rucupichinchae, 1662
hex., March, Humboldt & Bonpland 46. (Lectotype: W fide
Garay 1978).

Altensteinia paleacea (H.B.K.) Kunth, *Syn. Pl. Aeq.* 1: 325. 1822.

Erect, terrestrial herb, 20-50 cm tall. Leaves rosulate, ovate-lanceolate to lanceolate, up to 15 cm long, 3 cm wide, reduced above to thin, papery, acute or acuminate sheaths. Flowers in dense, erect, terminal spikes; bracts narrowly triangulate, 15-20 mm long, 5 mm wide, long-acuminate, hyaline, more than twice as long as the flowers. Flowers white; ovary ovoid, 5-7 mm long, glabrous; dorsal sepal oblong-ovate, 3-4 mm long, 1-1.5 mm wide, obtuse, pendent; lateral sepals, concave, lanceolate, 4-4.5 mm long, 2 mm wide, acute to subacute, erect to slightly deflexed; petals white, narrowly ovate to narrowly obovate, 2-3 mm long, 1 mm wide, the base narrowed, the margin slightly erose toward the apex, the apex obtuse; lip white with darker veins, 3-3.5 mm long, the base slightly cordate, the margin fimbriate above, the disk with a pair of small calli at its base; column 1-1.5 mm long, the clinandrium a low ridge, the anther pedicellate.

Specimen studied: COSTA RICA. Prov. Cartago, paramo scrub on the crest of Cerro Buenavista, Cerro de La Mue ' . 3.5 mi. W of Villa Mills, 10,500 ft, 16 July 1962, G.L. Webster, K. Miller, and L. Miller 12376 F(2)!

Aa paleacea is found in high mountain paramos from Bolivia to Colombia and Costa Rica. Paramo vegetation occurs above 3500m in South America and above 3000 m in Costa Rica (Weber 1958). Paramos are wet, cold, and windy for most of the year and are often shrouded in clouds. The soils of the Costa Rican Paramos are poor and rocky. In wet depressions, Sphagnum bogs are common and on the rocky slopes shrubby bamboos often form nearly impenetrable thickets.

It is in these thickets that Aa paleacea was found. When not in bloom, all that is visible is a rosette of green leaves. In bloom, the small, white flowers are densely clustered in the spike, with long, thin, light brown bracts on leafless stems. A recent trip to relocate the species on the paramo at Cerro de La Muerte was unsuccessful.

The occurrence of *Aa paleacea* in Costa Rica points out the links between the orchid flora of the northern, high Andes and the Costa Rican paramo (Cuatrecassas 1957, Weber 1958). Seeds blown north may find suitable substrates and become established. This has also occurred with *Pterichis* Lindl., which has two species in the Costa Rican paramo (Glicenstein 1983), *Gomphichis*, and *Epidendrum criniferum* Lindl.

Acknowledgements

This research was supported by NSF grant DEB 81013184 to William Burger for the Flora of Costa Rica.

Literature Cited

- Cuatrecassas, J. 1957. A sketch of the vegetation of the northern Andean province. *Proc. Pacific Sci. Cong.* 4:167-173.
- Dressler, R. 1981. *The Orchids. Natural History and Classification.* Cambridge, Mass.: Harvard University Press.
- Garay, L. A. 1978. *Orchidaceae*, part 1. in G. Harling and B. Sparre, eds. *Flora of Ecuador*. no. 9. Goteborg and Stockholm: University of Goteborg and Rijksmuseum.
- Glicenstein, L. 1983. A new *Pterichis* species for Costa Rica. *Bull. Amer. Orchid Soc.* 53:278-283.
- Schultes, R. E. and A. S. Pease. 1963. *Generic Names of Orchids. Their Origin and Meaning.* New York: Academic Press.
- Weber, H. 1958. *Die Paramos von Costa Rica und ihre pflanzengeographische Verkettung mit den Hochanden Sudamerikas.* Wiesbaden: Akademie der Wissenschaft und der Literatur, Mainz.

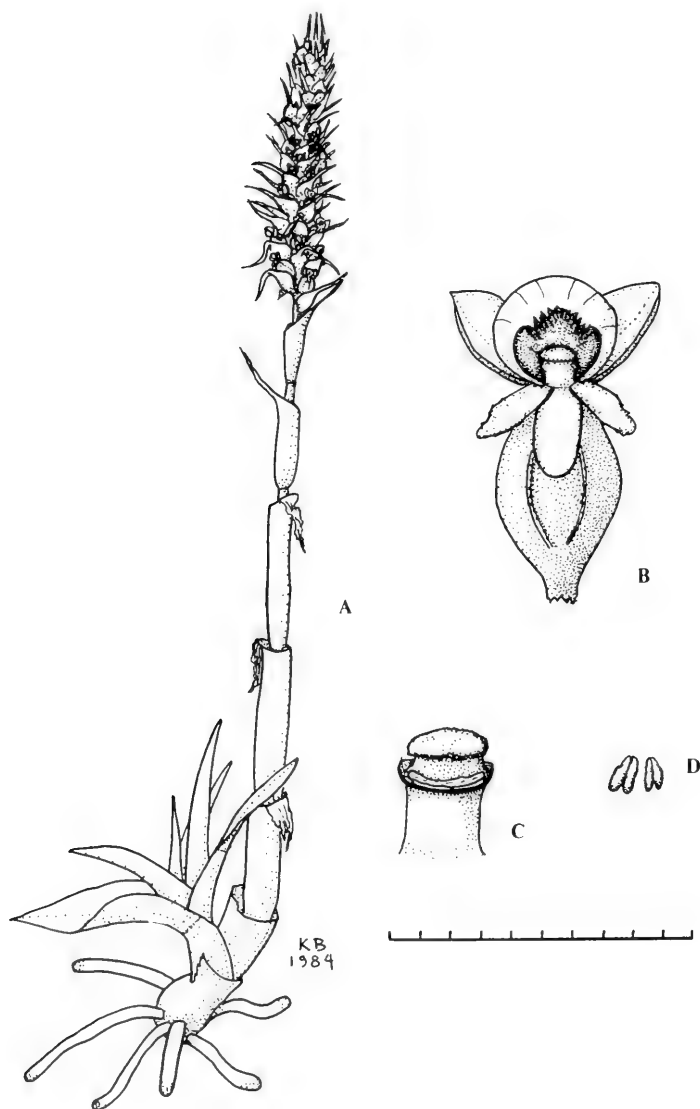


fig. 1. *Aa paleacea* Reichb.f. A. Habit. B. Flower. C. Column. D. Pollinia.

BOOK REVIEWS

Alma L. Moldenke

"PLANT GEOGRAPHY with Special Reference to North America" by Rexford Daubenmire, vii & 338 pp., 162 b/w photo., 17 maps & 34 tab. Academic Press Inc., New York, N. Y. 10003. 1978. \$39.50.

Any advance student of any phase of phytoecology, systematic botany or forestry will be the better prepared by reading and/or studying this book. Fortunately it is still available for purchase by individuals or librarians. [The author has directed that all royalties be donated to The Nature Conservancy.] The first part of this study is directed toward floristic plant geography dealing with "evolutionary divergence, migration and decline of taxa as influenced by past events in the earth's history", using geology, paleontology, morphology and cytogenetics more often than autoecology. The second mutually supportive part is directed toward ecologic plant geography, treating "plant communities as units having ranges to be interpreted". The many photographs and their legends are helpful.

"LAS GRAMINEAS DE MEXICO" Volume I, by Alan Ackerman Beetle, 260 pp., 145 b/w geog. distrib. maps, 80 pl. with 1, 2, 3 or 4 spp. each, 40 fig. & 15 color pl. Secretaria de Agricultura y Recursos Hidraulicos COTECOCA, printed by Editorial Calypso, S.A. Oculistas 43, Mexico 8, D. F., Mexico. 1983. Paperbound.

The author will be recognized by very many readers as the highly competent, recently retired, American agrostologist, giving this series an excellent start. Volume 4 will carry the bibliography. Over a thousand grasses have been reported for Mexico, including at least 230 endemics, 630 natives and 140 introduced, with some cultivated (such as all the grains except *Zea mays*) and many forage plants. There is an easily readable and workable key to the subfamilies, tribes, genera and species of the "GRAMINEAE (POACEAE)". There are separate listings of grasses to particular areas. The diagnostic drawings on the large plates show both general plant appearances as well as enlarged details of the flowering and/or fruiting structures.

"ROADSIDE FLOWERS OF TEXAS" paintings by Mary Motz Wills, text by Howard S. Irwin, xiii & 295 pp., 64 color pl., & 4 b/w pl. University of Texas Press, P. O. Box 7819, Austin, Texas 78712. 1961. \$8.95 paperback.

This book is the most widely sold of all publications from this

press, being reprinted time and again. The beautifully and accurately painted plates show general form of the flowering plant and often also an enlargement of the flower structure. The plate numbers are carried over to the outer margins of the plant descriptions grouped by their botanical families. There is also a clear key for amateur use. The key and descriptions are prepared by a well known taxonomic botanist. Since publication of the original work some of the scientific names have been changed, but such information does not serve this lovely book's primary purpose.

"BEGONIAS - 1984 Update" by Mildred L. Thompson, vi & 50 pp., 20 b/w photos & 2 draw., published by Edward J. Thompson, P. O. Box PP, Southampton, New York 11968. 1984 paperbound.

This addendum to the author's "Begonias: The Complete Reference Guide" (Times Books, 1981) lists and describes 610 new and 301 revised taxa and cultivars "for which there is additional information for classification, blooming, country and/or originator, and/or date". Additional taxonomic and horticultural literature is cited in the bibliography. The photographs are beautifully clear. Since botanical explorations continue with new species findings and since most of the cultivars are hybrids, another updating supplement should reasonably be expected in another couple of years.

"A Revised Handbook to the FLORA OF CEYLON, Volume IV" edited by M. D. Dassanayake & F. R. Fosberg, ix & 532 pp., 5 b/w pl., 2 color pl. & 2 tab., published for the Smithsonian Institution & the National Science Foundation and printed by the Amerind Publishing Co. Pvt. Ltd., New Delhi, India 110001. 1983. \$38.50.

Like the three previously published volumes this one brings up-to-date and available Trimen's famous flora (1893--1900), Alston's additions and corrections (1931) and Abeywickrama's checklist (1959) with the field and herbarium studies of specific family groups: the *Anacardiaceae* by W. Meijer, the *Apocynaceae*, *Asclepiadaceae* and *Periplocaceae* by H. Huber, the *Begoniaceae* by A. H. M. Jayasuriya (who served so excellently as our main guide during our field work), the *Burmanniaceae*, *Campanulaceae*, *Lobeliaceae* and *Sphenocleaceae* by L. H. Cramer, the *Zingiberaceae* by B. L. Burtt & R. M. Smith, the *Verbenaceae*, *Avicenniaceae*, *Nyctanthaceae* and *Symphoremaceae* by H. N. & A. L. Moldenke. The two color photographs are of *Avicennia* species. The book's inner covers show the districts of this island now called Sri Lanka. The field experience associated with the preparation of this work must surely have been appreciated by all the specialist-botanists as well as by the often college educated trainees who will be tomorrow's botanists, teachers and field workers in their native land.

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THE ALGAE OF NEW JERSEY (U.S.A.)
 VI. CHLOROPHYTA (GREEN ALGAE)
 A. VOLVOCALES, TETRASPORALES AND ULOTRICHALES

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This is the sixth paper in a series which examines the distribution of the algae in the State of New Jersey.

The chlorophyta is a large and diverse division of algae, so much so, that one can speak of the green algae only in general terms. Most green algae are fresh water forms but there are marine species, too.

The genera are listed alphabetically within each order and the collection dates chronologically within them. If no author citation is given, the species was collected during the course of my work.

DIVISION CHLOROPHYTA

GREEN ALGAE

VOLVOCALES

Chlamydomonas globosa Snow

Johnson Pond, New Brunswick, Aug-Oct (7)

C. pseudopertyi Pascher

golf course ditch, New Brunswick, Sept-Oct (7)

C. vectensis Butcher

northern shore (11)

Eudorina elegans Ehr.

D/R Canal (13); golf course ditch and Johnson Pond, New Brunswick (7); Millstone River, autumn (4); Hackensack River

Gonium pectorale Mueller

state (3, 16); rare in stagnant waters (2); D/R Canal, Mar-Dec (13); Johnson Pond, New Brunswick, Aug (7); Hackensack River

G. sociale (Duj.) Warming

D/R Canal, Jun-Mar (13); Hackensack River

Haematococcus lacustris (Girod.) Bory.

Hackensack River

Pandorina morum Bory.

pools of stagnant water (2); D/R Canal, May-Nov (13); Johnson Pond, New Brunswick, spring and summer (7); Raritan River, spring-autumn (4); Hackensack River

Pleodorina illinoisensis Kofoid

D/R Canal, Aug-Sept (13); Johnson Pond, New Brunswick, June (7)

Volvox aureus Ehr.

D/R Canal, July (13)

V. globater L.

ponds in Newark and Camden (2); D/R Canal, June-July (13)

V. stellatus Ehr.

in ponds about Plainfield (2)

V. tertius Meyer

Millstone River, rare in spring (4)

TETRASPORALES

Elakatothrix gelatinosa Wille

Hackensack River

Gloeocystis gigas Kutz.

D/R Canal, Jul-Oct (13); Johnson Pond, New Brunswick, Aug (7); Hackensack River

G. major Gerneck ex. Lemmer.

golf course ditch, New Brunswick, Sept (7)

G. vesiculosa Naegli

wet places, old wood, etc. (2); Johnson Pond, New Brunswick, Feb (7)

Nannochloris atomus Butcher

Raritan estuary (12); northern shore (11)

N. bacillaris Naumann

Oradell Reservoir, occasional in plankton, Jul-Oct (5)

Palmella botryoides Kutz.

marshy ground, wet timbers, etc. (2)

P. hyalina Breb.

marshy ground, wet timbers, etc. (2)

P. miniata Deibl.

marshy ground, wet timbers, etc. (2)

P. mooreana Harv.

marshy ground, wet timbers, etc. (2)

P. mucosa Kutz.

marshy ground, wet timbers (2); Raritan River, spring and south branch of Raritan, autumn (4); Oradell Reservoir, Aug (5); Hackensack River

Sphaerocystis schroeteri Chodat

D/R Canal, Jun-Sept (13); north and south branches of Raritan River, common in summer (4)

Tetraspora bulbosa (Roth) Ag.

sluggish waters (2)

T. cylindrica (Wohl) Ag.

golf course ditch, stream, Raritan River and Johnson Pond, all New Brunswick, (7)

T. explanata (Kutz) Kirch.

wet timbers (2)

T. gelatinosa (Vauch) Desvaux.

state (3)

T. lubrica (Roth) Ag.

sluggish waters (2); north branch of Raritan River, Millstone River and Raritan River, abundant in spring (4)

ULOTRICHALES

Aphanochaete globosa (Nordst) Wolle

Hammonton pond (2)

A. repens A. Braun

parasitic on other fresh water algae (2); south branch of Raritan River, on Cladophora glomerata (4)

Chaetophora elegans (Roth) Ag.

attached to leaves, sticks in brooks and stagnant waters, Hudson Heights, Grantwood, Greenwood Lake (6); Raritan River (7); mostly spring (3)

C. endiviaefolia Ag.

not rare in ponds (2)

C. incrassata (Hudson) Hazen

sticks, stones, leaves in brook, Grantwood (6)

C. pisiformis Ag.

not rare in ponds (2); brooks, chiefly attached to pebbles and rocks, Hudson Heights and Demarest (6); running water (3)

Chaetospheridium globosum (Nordst) Klebahn

Hammonton (6); on algae, chiefly Oedogonium (3)

Coleochaete irregularis Prings.

on aquatic plants (2); state (3)

C. orbicularis Prings.

very common in ponds (2); state (3)

C. scutata Breb.

very common in ponds (2)

C. soluta (Breb.) Prings.

frequent (16); frequent in ponds (2); state (3); stream in New Brunswick (7)

Cylindrocapsa geminella Wolle

not frequent in ponds (2); in standing water (3)

Draparnaldia acuta Kutz.

brooks, rills, semi-stagnant waters in Hudson Heights, Cresskill and Undercliff (6); state (3)

D. glomerata Ag.

frequent in spring water (2); attached to grass, sticks, stones, earth in active or quiet waters, Grantwood, Hudson Heights (6); very common in brooks in spring (3)

D. playtzonata Hazen

rocks or sticks in brooks draining swamps (6); state (3)

D. plumosa Ag.

spring waters (2); running water in Hudson Heights, Demarest and Englewood (6); golf course ditch, north branch of Raritan River (7); Millstone River (4)

Geminella minor (Nag.) Heering

Millstone River, rare in late autumn (4)

Gomontia polyrhiza

Barneget Bay (15)

Hormidium klebsia G.M. Smith

Raritan River, rare in summer (4)

Microspora amoena (Kutz) Lager.

Undercliff, Englewood, in brooks (6); state (3)

M. floccosa (Vauch.) Thuret

Grantwood, Edgewood and Weehawken, in streams (6); very common spring plant in slow streams and quiet waters (3)

M. quadrata Hazen

Millstone River, rare in autumn (4)

M. stagnorum (Kutz.) Lager.

stagnant water, Grantwood and Edgewater (6); golf course ditch New Brunswick (7)

M. tumidula Hazen

Hudson Heights, Grantwood and Undercliff (6); brooks and pools (3); north and south branches of Raritan River year round (4)

M. willeana Lager.

Grantwood, Edgewater (6); state (3); north and south branches of Raritan River (4); Oradell Reservoir (5)

Microthamion kuetszingianum Nageli

Johnson Pond (7); Oradell Reservoir, Apr-July (5)

Protococcus viridis Ag.

everywhere (2); Mullica River all year (8)

Protoderma viride Kutz.

Millstone River, south branch of Raritan River (4)

Pseudendoclonium submarinum

Barnegat Bay (15)

Stichoccus cylindricus Butch.

Raritan estuary, June, July and Oct (12)

S. fluitans Gay

in cascades on oblique surfaces of rocks, Undercliff (6); state (3)

S. subtilis (Kutz.) Klercker

Long Branch, Undercliff (6); Hackensack River

S. bacillaris forma confervoides Hazen

Ridgefield (6); found among algae in rather quiet water (3)

Stigeoclonium lubricum (Dillw.) Kutz.

clear running water (3); north and south branches of Raritan River, Millstone River, Raritan River (4, 7)

S. lubricum var varians (Hazen) Collins

state (3)

S. pachydermum Prescott

Johnson Pond, New Brunswick (7)

S. radians Kutz.

on aquatic plants, frequent (2)

S. subsecundum Kutz.

never found floating (3)

S. subuligerum Kutz.

state (3)

S. tenue (Ag) Kutz.

frequent in flowing waters (2)

S. ventricosum Hazen

state (3)

Trentopohlia daviesii (Dillw) Harv.

Atlantic City (2)

T. odorata (Wiggers) Witte

state (3)

T. vigatula (Harv.) Farlow

Atlantic City (2); on Zostera (10)

Ulothrix aequalis Kutz.

golf course ditch, Johnson Pond (7); Millstone and Raritan Rivers (4); Mullica River (8)

U. flacca (Dillw) Thur.

wharves, Atlantic City (2); Undercliff, Atlantic City (6); state, common between tide marks (3); coast (14); Raritan River (1); not uncommon on algae (10)

U. flaccida Kutz.

in damp or wet places (2)

U. implexa Kutz.

Undercliff, on rocks (6); state (3); Mullica River (9); Barnegat Bay (8); Barnegat Bay, Jan, Mar and Apr (15)

U. isogona (Smith) Thur.

not uncommon on woodwork, Atlantic City (10); New York Bay (2)

U. oscillarina Kutz.

north and south branches of Raritan River (4)

U. parietina (Vauch.) Kutz.

at base of trees (2)

U. subtilis Kutz.

varieties in flowing water (2)

U. tenerrima Kutz.

north and south branches of Raritan River, Raritan River (4); Oradell Reservoir, Apr-Nov (5); Hackensack River

U. tenuis Kutz.

in rapid waters (2)

U. tenuissima Kutz.

Fairview, in running water (6); Raritan River (7); north and south branches of Raritan River, Raritan and Millstone Rivers (4)

U. varia Kutz.

on moist earth (2)

U. variabilis Kutz.

Undercliff, brooks (6); north and south branches of Raritan (4)

U. zonata (Weber & Mohr) Kutz.

streams (2); Nordhoff (6); north and south branches of Raritan River, Millstone and Raritan Rivers (4)

References

1. Abbiate, L. 1961. An ecological study of the attached algae of Raritan Bay. M.S. Thesis. Rutgers. New Brunswick.
2. Britton, N. 1889. Catalogue of Plants Found in New Jersey. Final Report State Geologist. John L. Murphy Pub. Trenton.
3. Collins, F. 1928. Green Algae of North America. G.E. Stechert & Co. New York.
4. Edgar, R. 1968. A survey of the benthic algal flora of the Raritan River drainage basin. M.S. Thesis. Rutgers. New Brunswick.
5. Foote, M.A. 1981. Bull. N.J. Acad. Sci. 26:49-51
6. Hazen, T. 1902. Mem. Torrey Bot. 11:135-250
7. Keller, J. 1954. A study of the periodicity of fresh water algae in the vicinity of New Brunswick, N.J. Ph.D. Thesis. Rutgers. New Brunswick.
8. Moeller, H. 1965. The attached algae of the Great Bay and Mullica River, New Jersey. M.S. Thesis. Rutgers. New Brunswick.

9. Moeller, H. 1965. Bull. N.J. Acad. Sci. 9:27-30
10. Morse, 1888. Bull. Torrey Bot. Club 15:309-14
11. Olsen, P. and M. Cohn. 1979. Bull. N.J. Acad. Sci. 24:59-69
12. Patten, B. 1962. Jrl. Mar. Res. 20:57-75
13. Renlund, R. 1953. A study of the net plankton of the Delaware and Raritan Canal. Ph.D. Thesis. Rutgers. New Brunswick.
14. Richards, H. 1931. Botanica 13:38-46
15. Taylor, J. 1970. The ecology and seasonal periodicity of benthic marine algae from Barnegat Bay, New Jersey. Ph.D. Thesis. Rutgers. New Brunswick.
16. Wolle, F. 1887. Freshwater Algae of the United States. Commenius Press. Bethlehem, Pa.

ADDENDUM: ULOTRICHALES

Blidingia minima (Nag) Kylin

Barnegat Bay, March (15)

Entocladia viridis

Barnegat Bay, almost all year (15)

Percursaria percusa (Ag) J. Ag

Great Bay, June (9); Barnegat Bay, July (15)

Pilinia moresi Collins

on woodwork (3)

Ulvella lens

Barnegat Bay, almost all year (15)

SOME OBSERVATIONS ON THE AQUATIC VASCULAR FLORA OF THE HANCOCK
COUNTY, ILLINOIS SECTION OF THE MISSISSIPPI RIVER

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ABSTRACT: The submerged and floating aquatic vascular flora of the Hancock County, Illinois section of the Mississippi River consists of herbaceous plants which occur in two divisions, nine families, 12 genera and 21 species. Most of the species are monocots (85.7%) whereas there are only one fern and two dicot species. Eight (38.1%) of the species are floating and two species (9.5%) are alien. Twelve of the species were not recorded before 1952. This flora is a dynamic and important one which should be continually monitored.

INTRODUCTION

With the establishment of the Western Illinois University Alice L. Kibbe Life Science Station and its herbarium in 1964, a program of studying the aquatic vascular plant flora of the Mississippi River that borders on west-central Illinois was initiated. The first project was to inventory the submerged and floating vascular plants. This paper reports the results of that inventory along Hancock County and some associated observations concerning that flora. Voucher specimens are deposited in the station herbarium (WARK) and family and species nomenclature follows Mohlenbrock (1975).

LIST OF PLANTS
(and their occurrence)

DIVISION POLYPODIOPHYTA

Salviniaceae

Azolla mexicana Presl (occasional and erratic)

DIVISION MAGNOLIOPHYTA

CLASS MAGNOLIOPSIDA

Ceratophyllaceae

Ceratophyllum demersum L. (common)

Nelumbonaceae

Nelumbo lutea (Willd.) Pers. (common)

CLASS LILIOPSIDA

Hydrocharitaceae

Elodea canadensis Michx. (frequent)
Elodea nuttallii (Planch.) St. John (frequent)
Vallisneria americana Michx. (common)

Lemnaceae

Lemna minor L. (common)
Spirodela polyrhiza (L.) Schleiden (common)
Wolffia columbiana Karst. (common)
Wolffia papulifera Thompson (occasional)
Wolffia punctata Griseb. (frequent)

Najadaceae

Najas flexilis (Willd.) Rostk. & Schmidt (frequent)
Najas guadalupensis (Spreng.) Magnus (frequent)
Najas minor All. (occasional)

Pontederiaceae

Zosterella dubia (Jacq.) Small (common)

Potamogetonaceae

Potamogeton crispus L. (common)
Potamogeton foliosus Raf. (occasional)
Potamogeton nodosus Poir. (common)
Potamogeton pectinatus L. (common)
Potamogeton pusillus L. (occasional)

Zannichelliaceae

Zannichellia palustris L. (frequent)

FLORISTIC ANALYSIS

The submerged and floating aquatic vascular flora of the Hancock County, Illinois section of the Mississippi River are herbaceous plants which occur in two divisions, nine families, 12 genera and 21 species. Of the species, one (4.8%) Azolla mexicana, is in the Polypodiophyta and 20 (95.2%) are Magnoliophyta. Within the angiosperms, 18 species (90%) are Liliopsida (monocotyledons) and two (10%) Ceratophyllum demersum and Nelumbo lutea are in the Magnoliopsida (dicotyledons). The monocots represent 85.7% of all the species whereas the dicots compose 9.5%.

Of the nine families in which the species occur, one (11.1%) is a Polypodiophyta and eight (88.9%) are Magnoliophyta. Within the angiosperms, six (75%) are Liliopsida and two (25%) are Magnoliopsida. The monocots represent 66.7% of all the families whereas the dicots compose 22.2%. The largest families are the monocot families Potamogetonaceae (five species), Lemnaceae (five species), Hydrocharitaceae (three species) and Najadaceae (three species). All the rest of the families have only one species each.

Of the 12 genera in which the species occur, one (8.3%) is a Polypodiophyta and eleven (91.7%) are Magnoliophyta. Within the angiosperms, nine (81.8%) are Liliopsida and two (18.2%) are Magnoliopsida. The monocots represent 75% of all the genera whereas the dicots compose 16.7%. The largest genera are the

monocot genera Potamogeton (five species), Najas (three species), Wolffia (three species), and Elodea (two species). All the rest of the genera have only one species each.

Floating species represent 38.1% (eight species) and submerged plants 61.9% (13 species) of the species. Two (9.5%) of the species (both submerged monocots) are old world aliens (Potamogeton crispus which was first recorded in 1966, Najas minor which was first recorded in 1978) which thus seem to have invaded this part of the Mississippi River since 1952 (they were not recorded as occurring in Hancock County by Kibbe (1952)). Although Potamogeton crispus seems to be more widespread presently than Najas minor, both are well established and increasing and thus could be a threat to the native species.

It is of interest to note that Kibbe (1952) who completed an intensive study, survey and summary of the Hancock County flora from 1833 to 1952 did not include twelve of the 21 species found today (some commonly): Elodea canadensis, Elodea nuttallii, Najas flexilis, Najas guadalupensis, Najas minor, Potamogeton crispus, Potamogeton pusillus, Vallisneria americana, Wolffia columbiana, Wolffia papulifera, Zannichellia palustris and Zosterella dubia. Also none of the remaining nine present-day species were documented by Kibbe (1952) as being collected in the Mississippi River before 1921 since she was cited as the collector of them. (Citations to collections made of aquatic vascular plants found in ponds and sloughs /particularly south of Warsaw/ are, of course, omitted from this paper since there is no evidence they were found in the river.) Therefore it appears that the aquatic vascular plants in the river did not receive major attention of the earlier botanical collectors of Hancock County. It is regrettable then that there is not only a lack of earlier documentation of these species and their occurrence and distribution but also that this lack of information includes the river aquatic vascular flora previous to the building of the Keokuk Dam in 1913 so that the effect of the dam on this flora could be more accurately assessed. Perhaps it was this lack of data that prompted Kibbe (1952) to state in her forward that "The Mississippi River is an almost untouched reservoir, containing a wealth of plant and animal life."

Today the most common species are Ceratophyllum demersum, Nelumbo lutea, Vallisneria americana, Lemna minor, Spirodela polyrrhiza, Wolffia columbiana, Zosterella dubia, Potamogeton crispus, P. nodosus and P. pectinatus. Most noticeably increasing are Najas spp., Nelumbo lutea (especially along the shoreline between Hamilton and Nauvoo), Potamogeton crispus, Vallisneria americana (particularly in recent sediments in deeper water) and Zosterella dubia. Kibbe (1952) recorded Lemna minor, Spirodela polyrrhiza and Ceratophyllum demersum as abundant which they still are. She states that although Potamogeton pectinatus, P. foliosus and P. nodosus are abundant where found they are not widely

distributed; today P. pectinatus and P. nodosus are probably much more widely distributed as well as abundant. Kibbe (1952) mentioned the occasional occurrence of Azolla mexicana and today that erratic distribution seems the same. The establishment of Nelumbo along the northern part of the county shoreline that she mentions is still valid although, as mentioned before, it is spreading towards Hamilton rapidly. Although Wolffia punctata seems to be today about the same as Kibbe (1952) noted (not often found but abundant where found), Wolffia columbiana which she did not mention is today common.

DISCUSSION AND SUMMARY

Hancock County has a Mississippi River waterfront of 42 miles with a land contact of 72 miles (Kibbe 1952). In 1913 at about the midway of the county shoreline a navigational-power plant dam was built across the river from Keokuk, Iowa to Hamilton, Illinois. In effect, this divided the river along this shoreline into two different aspects so that north of the dam is a slower flowing lacustrine system whereas below (south of) the dam it is a more rapid flowing riverine system. Thus the best and most extensive development of the submerged and floating aquatic vascular plants are north of the Keokuk dam where during time there has been a general increase in sedimentation and changing shorelines and backwaters of the river. An example of a changed shoreline is the large bend of the river at the southern edge of Nauvoo which around 20 years ago was a shallow water area completely covered with Nelumbo whereas today there is forming near the center of this area a wooded (much Salix) island with a slew at the rivers margin. Besides in the larger bends of the river, increased sedimentation has been noticeably occurring at the mouths of tributaries, between islands near and in coves of the shoreline and behind the dam. As a result there are more favorable growing conditions such as reduced current and wave action (the wing dams south of the Keokuk dam also increase the current there), less water-level fluctuations, a more stable substrate (which consists of a high amount of mud and silt), less substrate washing, eroding and scouring, and less turbid water. Perhaps this increasing lacustrine habitat accounts for relatively large number of species recorded for this study area since 1952 as well as the increasing distribution of species (Nelumbo lutea for example).

I would like to rectify an inadvertent omission concerning the Hancock County Mississippi River flora in Henry (1977) where on p. 427 it states that only Lemna minor and Ceratophyllum demersum were found in the river. Wolffia punctata, W. columbiana, Spirodela polyrhiza and Potamogeton pectinatus were also found in the river there. Probably in the river there are other species of Lemna besides L. minor which will be found upon careful examination of Lemna collections.

This aquatic vascular flora is dynamic in that the species composition, diversity, distribution and amount is constantly changing. The yearly seasonal waxing and waning of this plant biomass is spectacular. This flora merits continued floristic monitoring including studies on its phenology and all aspects of its ecology. The importance of these photosynthetic plants to the well being of the ecosystem of which they are part including food, substrate and shelter for invertebrate, vertebrate, micro-organismal and other wildlife, mineral and nutrient recycling, chemical and physical effects as well as just being a part of our environment warrants their protection and preservation. The aesthetic as well as the potential usefulness of them to man's livelihood must also be considered. Most of the threats to this vegetation is due to man such as various types of pollution, effect of barge and other navigational operations, recreational and housing activities, hunting and fishing disturbances, dredging, etc. As noted previously, the threat of alien plants (and perhaps animals) that are now starting to invade and spread must be addressed. Perhaps the most challenging, and maybe frustrating, aspect of working with this river system is dealing with an area that is a multiple-usage one (i.e. recreation, navigation, aesthetics, etc.). Wise management (along with appropriate mitigation efforts) is a must for maintaining the integrity of this ecosystem.

LITERATURE CITED

- Henry, R. D. 1977. Catalogue of the vascular plants of the Western Illinois University Alice L. Kibbe Life Science Station and vicinity. Trans. Ill. State Acad. Sci. 69(4): 425-436.
- Kibbe, A. L. 1952. A Botanical Study and Survey of a Typical Midwestern County (Hancock County, Illinois). The author, Carthage, Illinois and Gem City Business College, Quincy, Illinois. 431 pp.
- Mohlenbrock, R. H. 1975. Guide to the Vascular Flora of Illinois. Southern Illinois University Press, Carbondale. 494 pp.

ADDITIONAL NOTES ON THE GENUS *GMELINA*. II

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GMELINA L.

Additional & emended bibliography: Chaudhuri, Indian For. 51: 57--60, pl. 3, fig. 3. 1925; Gaussen, Leroy, & Ozenda, Précis Bot. 2: 406. 1982; Mold., Phytologia 55: 308--342 & 424--442. 1984.

GMELINA ARBOREA Roxb.

Additional bibliography: Mold., Phytologia 55: 424--442. 1984.

Streets (1962) provides dates and growth history of *Gmelina* introduction in the Fiji Islands, Ghana, Kenya, Malawi, Malaya, Nigeria, Sabah, Sierra Leone, Solomon Islands, South Africa, Tanzania, Uganda, and Zimbabwe.

A summary of the economic uses of *Gmelina arborea* follows, taken mainly from the works of Spach (1840), Dymock (1884), Dymock, Warden, & Hooper (1893), Pearson (1912), Kirtikar (1918), Bois (1928), Benthall (1933), Dastur (1952), Sastri (1956), Chopra & al. (1958), Irvine (1961), Jain (1964), Maheshwari & Singe (1965), Jain & De (1966), Burkill (1966), Patel (1968), Agarwal (1970), Rao (1970), and Hartwell (1971). The tree, being a pioneer, is able to crowd out undesirable grasses, such as *Imperata* where they pose a problem. It is valuable in afforestation and reforestation as a source of timber and paper-pulp. It coppices well and is suitable as a shade or ornamental tree in gardens, parks, or along avenues. Cubitt (1920) avers that it yields good firewood, but will not suppress lalang. Its young shoots are eaten by cattle (sometimes), antelope, and deer as fodder.

The roots are used as a bitter or bittersweet tonic, stomachic, laxative, galactagogue nerve tonic in epilepsy since remote times. They form one of the ingredients of the Ayurvedic dasamula or "ten-roots" (along with *Desmodium gangeticum*, *Tribulus terrestris*, etc.) which is used in the treatment of many diseases; taken with licorice, honey, and sugar it increases the secretion of milk. In Bombay it is used as a demulcent in treating gonorrhea. The roots form an ingredient of various powders, balms, and enemas. The pulverized root is employed in treating gout, burning body sensations, fevers, indigestion, anasarca, abdominal pains, and hallucinations. In northern India it is believed to have anthelmintic properties and is used to improve the appetite and to treat piles and abnormal thirst, tridosha and urinary discharges. As a ghee it is used to treat abdominal tumors; with clarified butter, to treat nasal polyps. A decoction of the root bark is used internally in treating snakebites and scorpion stings, but Kirtikar (1918) quotes Mhaskar & Caius to the effect that "All parts of the plant are equally useless in the antidotal treatment of snakebite or scorpion sting!" As one of five plant species, it is used in the treatment of intermittent and typhoid fevers.

The bark is used medicinally and also by arrak manufacturers to regulate the fermentation of toddy. It is employed as a bitter tonic and stomachic, considered useful in combating fevers and indigestion.

The wood is employed in the manufacture of decks of boats, cattle-bells, picture-frames, and sandals; in the English trade known and sold as gumhar. It is good, durable under water, and resembles teak in its color, compactness, easy workability, resistance to cold and humidity as well as to the serious ravages of termites and shipworms. It is used in naval construction, to make small boats and canoes, and, in Burma, for mine-timbers. It is highly esteemed for planking, furniture, door panels, well-lining, house-posts, toys, drums, Indian musical instruments (like sitars), ornamental cabinet-work, carving, plates and trays, bridge construction, railroad ties, boxes and packing cases, carriages and palanquins, shafts, axles, and yokes, grain measures, agricultural instruments, tree-calipers, carved images, lacquered receptacles, and clogs. In Hindustan it is used to make the cylinders for dholucks drums; in Assam it is employed in the making of dugouts, matchsticks, artificial limbs, native stethoscopes, and sluices. The wood-pulp is widely used worldwide for making wrapping, writing, and printing paper. In Bangladesh the wood is employed chiefly for boat- and ship-building. Pearl-ash or potash salts are derived from the burning of the wood, and a yellow dye is also obtained in this way.

Chopra and his associates (1958) summarize: "The root, fruit, bark and leaves of this plant have all been used in medicine, but the root and fruit are preferred....Combined with liquorice, honey and sugar, it is considered to be galactagogue." They re-assert its use for snakebites and scorpion-stings and add that it is reputed to have anti-tubercular properties.

The flowers are used in treating leprosy and blood diseases. Their juice is said to be bitter, acrid, and astringent.

The fruits are described as both bitter and sweet, sour and acrid. They are used medicinally as a cooling agent, diuretic, tonic, aphrodisiac, and alterative, as an astringent to the bowels, to promote the growth of hair, and in treating leprosy, ulcers, and consumption, as well as strangury and abnormal vaginal discharges. It is said to be useful in treating vata, abnormal thirst, and anemia. The mesocarp is quite edible -- natives of India and Burma thoroughly rub the ripe fruits by hand, the rind is removed, then dried in the open sun, and finally boiled and eaten. The extract of the fruit is said to be useful in body rejuvenation and disease-resistance. In experimental rabbits it gave an indication of increased percentages of α -2 and γ globulin fractions, a gain in body weight, and an increase in alertness and physical behavior. It is used in many popular cooling decoctions in cases of fevers or bilious ailments. It also provides a very persistent yellow dye.

The leaves are sometimes used as fodder by cattle. They contain apigenin, luteolin, quercetin, hentriacontanol, and beta-sitosterol as crystalline compounds. The additional presence of glycosides of flavones is suspected. The juice of the tender leaves, as a decoc-

tion, is demulcent; mixed with milk and sugar it is used in treating gonorrhea, coughs, and catarrh of the bladder. Externally applied, the juice is used as a lotion in treating ulcers and maggot-infested wounds and sores. A paste made from the leaves is applied to the head in treating headache during fevers. The leaves have been recommended and are used in Assam for raising eri silkworms when *Ricinus* or *Heteropanax* leaves are not available.

Gamble (1878) refers to the timber of this tree as "one of the best Lower Hill woods". In his 1902 work he cites B.295 & 1425, C. 835, 959, 2775, & 3549, E.676, 948, 1390, 1433, 2193, 2395, 3605, 3620, & 3693, as well as Mendis 30 and Nordlinger Sections Vol. 4, as very good wood samples. The wood itself is described by Kribs (1968): color uniformly cream or light yellowish-brown, turning russet with age; luster high and silky; odor and taste not distinct. It is light and soft, with a specific gravity of 0.47 (air-dry) and weight of 30 pounds per cubic foot; grain straight and roey; texture medium; easy to work, takes a high lustrous finish; growth-rings indistinct, although the vessels are slightly larger at the beginning of the growth zone; vessels distinct without lens, not numerous, irregularly distributed to slightly echelon, solitary and in radial groups of 2--4, the tangential diameter 143 mu to 285 mu, averaging 220 mu; the lumina with tyloses; the pits alternate, 10--14 mu in diameter; fibers septate with simple pits; parenchyma vasicentric, 2--5 cells wide, confluent, connecting 2 or 3 pores and at certain intervals forming tangential bands resembling terminal; apotracheal diffuse; rays visible without hand-lens in the cross-section, not conspicuous in the radial section, of heterogeneous type III, 1--5 (mostly 3 or 4) cells wide and 15--25 cells high; lumina with yellowish gum; ray-vessel pits round to oval, simple to half-bordered; ripple marks absent; gum ducts absent. As to its economic use he says: "furniture and cabinets, interior finish, millwork, boatbuilding (decking and planking), musical instruments, boxes and carving. A substitute for Prima vera and Avodire." Normand (1931) also provides a detailed description of the wood anatomy.

Nair & Rehmann (1962) describe the pollen as 3-zonicolporate, the endocolpium very faint, the ectine surface reticulate. These characters apply also to the pollen of *G. asiatica* L. and *G. philippensis* Cham., but in the former the grains are smaller (39 x 26 mu) and in the latter larger (49 x 37 mu). In further detail, the pollen grains of *G. arborea* are prolate spheroidal, 39 x 35 mu (range 33--44 x 32--39 mu), the colpi ends are acute, tenuimarginate, the membrane minutely crustate, the apocolpium diameter is 3.5 mu, the endocolpium is very faint, the exine is 1.4 mu thick, and the ectine almost as thick as the endine and reticulate, the lumina small. These characters were taken from Herb. Nat. Bot. Gard. Lucknow 6680, SI. 2701 in the Lucknow herbarium.

Specimens of *G. arborea* with toothed or lobed leaves are usually from seedlings or from turions (watersprouts) and are discussed herein under f. *dentata*, which see. Hooker (1848) states in his specific description that the leaf-blades are either entire or lobed: his accompanying illustration depicts a flowering branch which bears one leaf with a single lobe.

Sastri (1956) informs us that "This handsome tree, which is never gregarious and nowhere very common, is a light demander, moderately frost-hardy and intolerant of excessive drought. It prefers moist fertile valleys with good drainage. Natural reproduction takes place in the rainy season soon after the drupes fall to the ground. Alternating heat and moisture are necessary to stimulate seed germination. Clear ground, especially freshly broken ground forms a favourable germinating bed; seeds lying among weeds and grass usually fail to germinate.

"Artificial reproduction may be carried out by direct sowing or by transplanting. Direct sowing in lines 10--12 ft. apart, with a distance of c. 1 ft. between the plants, has given good results. The plants are thinned out in the third year if necessary. Dibbling of seed (4--5 seeds at each peg) with a spacing of 6 ft. x 6 ft. and broadcast sowing also give satisfactory results. For transplanting purposes, seeds are sown in drills in nursery beds shortly before rains. Seedlings are transplanted in the first rainy season when 3--4 in. high. If the plants are to be kept for a year in the nursery they are pricked out to c. 9 in. apart in the first rains and planted out in the next rainy season with the stem pruned down to 2 in. and the root trimmed to 1 ft. A spacing of 6 ft. x 6 ft. is ordinarily suitable. The rate of growth is fast and the tree is well adapted for treatment as coppice....

Sastri continues: "The tree is browsed by animals. Damage is also caused by defoliators (*Calopepla* spp.) and borers (*Dihammus* spp. and *Alicide* spp.). A fungus, *Poria rhizomorpha* Bagchee, causes stem and root diseases in shady, unfavourable and water-logged situations and in clayey soils....." He gives another detailed description of the wood and notes that it "seasons well without cracking or warping, but is slow to dry both in the open and in the kiln. Green conversion and open stacking with crossers under cover are recommended." In water it is quite durable and buried in soil lasts about 15 years. It is easy to saw and peels well on a rotary lathe, sometimes exhibiting a silvery sheen.

Sastri also reports that the fruits contain butyric acid, tartaric acid, resin. and saccharin. An alkaloid occurs in the bark and root, the latter also showing traces of benzoic acid, resin, and a saccharin compound. "The calorific value of the wood (silica-free ash, 1.54 percent) is 4,763 cal., 8,547 B.t.u. When subjected to destructive distillation, the following carbonization products are obtained: charcoal, 31.3; total distillate, 47.1; pyroligneous acid, 37.1; tar, 10.0; pitch and losses, 2.4; acid, 4.47; esters, 3.42; acetone, 2.38; and methanol, 1.23 percent. The non-condensable gases (1.88 cu. ft./lb. at N.T.P.) contain: carbon dioxide, 59; carbon monoxide, 31.75; methane, 4.5; hydrogen, 4.15; and unsaturated hydrocarbons (as ethylene), 0.6 percent." Kapoor (1969) reports an unidentified alkaloid present. Gibbs (1974) reports tannin present, but cyanogenesis is absent from tested shoots and the bark gives a negative result in the Juglone test. He found leucoanthocyanin absent from the leaves.

Roxburg (1832) gives a fascinating account of his observations

about the wood of *Gmelina arborea*, which he refers to as "A large timber tree, a native of the mountainous parts of India. Flowering time [is] the beginning of the hot season.....The wood of this tree is used for a variety of economical purposes by the natives of various countries where it grows. That of such trees as will square into logs from eighteen to twenty-four inches resembles Teak more than any other sorts I have yet met with. The colour is almost exactly the same, the grain rather closer, at the same time it is fully as light, if not lighter, and as easily worked. Some years ago I received.....a large square log.....which measured nearly thirty feet in length, and at the thickest end was full twenty-four inches square." He placed an outside plank of this log "in the river, a little above low water mark, exactly where the [ship]worm is thought to exert its greatest powers. After remaining three years in this situation.....the piece was cut....and....found....as sound and every way as perfect throughout, as it was when first put into the river. Amongst other things, a valuable floor door was made of it, to keep the tide out of the [Calcutta] Botanic Garden. It is now seven years and a half since the door (which is four feet square) was made, and though much exposed to the sun and water, yet it remains good; while similar doors, though much smaller, made of Teak, were so much decayed, a year ago, as to render it necessary to replace them.

"In addition to my own experiments", he continues, "I have lately learned that the decks of pinnaces to the eastward, about Chittagong, Datta, &c. are made of this timber, because it bears the weather better than any other [timber] they know without shrinking, or warping." He adds that it is his opinion that this wood would be useful "for the bottoms, and upper works, of vessels, as well as for knees, curved timbers, &c."

Jan & Tarafder (1970) list the medicinal uses of *G. arborea*, with source references for each, in the treatment of swelling of the throat and choking, dropsy and anasarca, spleen troubles, pains, rheumatism, rigid thigh, jhangibat, jhunka bat, epilepsy, convulsions, colic, mad convulsions and fits, delirium, tihurla mirgibai, smallpox, syphilis, sores, urticaria, dyspepsia, cholera, phthisis, bronchitis and asthma, diarrhea, intoxication, blackness of lips and tongue, the bite of rats, tigers, crocodiles, snakes, lizards, etc., hemorrhagic septicemia, rinderpest, anthrax, and gravel. Truly the original wonder-drug!

Odeyemi (1970) found the total lignin in *G. arborea* wood to be 31 percent (plus or minus 1 percent). The most favorable sulphuric acid concentration for the solution of this lignin in wood pulp preparation is 66--74 percent. A higher percentage could be used with good results only if the reaction time is less than one hour. The primary hydrolysis reaction could be carried out advantageously under the tropical laboratory room temperature of 28--30° C. The use of a mixture of sulphuric acid (sp. gr. 1.84) and HCl (sp. gr. 1.18) in the ratio of 2:1 or 1:1 by volume is recommended.

López-Palacios (1982) records the use of this plant in the treatment of asthma in Venezuela.

Joshi & Singh (1970) report obtaining a new lignin (gmelinol) from the aqueous extract of the heartwood, while from the benzene

extract of the same heartwood was isolated η -octanosanol. Luteolin was isolated from the leaves by Venkata Rao and his associates (1967). Gibbs (1974) found syringin absent from the stems and reports a negative result with the HCl/methanol test.

Lamb (1970) warns of the risks inherent in *Gmelina* monoculture: "Los forestales que trabajan en los trópicos deben considerar los riesgos que implica el cultivo de *Gmelina* en plantaciones puras. Existe el riesgo de deterioro del suelo por estar éste expuesto en una plantación de esta especie decidua; el riesgo de la erosión del suelo si el fuego barre la hojarasca, y el riesgo de un araque tanto de insectos como de hongos, que es común a todos los rodales puros, y que puede resultar catastrófico. El deterioro del suelo por exposición es mucho mayor en zonas de elevada precipitación y con suelos arenosos, tal como ocurre en los distritos de Benin y en Enugu, Nigeria, donde debería alentarse un piso inferior para *Gmelina* en plantaciones destinadas a producir madera de obra. Si se cultiva para producir pulpa en rotación de monte tallar, el riesgo es mayor; no es posible ningún piso inferior y se debe tener mucho cuidado con esta contingencia cuando se proyectan plantaciones para producir madera de pasta. La acción del fuego acelera el deterioro del suelo y debería ser totalmente excluida de las plantaciones de *Gmelina* mediante métodos eficaces de protección."

Browne (1968) paints a rather bleak picture as to the susceptibility of *Gmelina arborea* to attack by disease and pests. As enemies he lists no less than 7 species of fungus, a mistletoe, a mollusk, a myriapod, 5 kinds of mammals, and 44 species of insects. His list, supplemented by reports from other investigators [Singh (1972), Lamb (1968), Raman & Das (1980), King (1966)], is as follows:

Fungi: *Armillaria mellea*, *Cercospora ranjita*, *Fomes lignosus*, *F. roseus*, *Ganoderma colossus* [*Phaeolus manihotis*], *Polyporus baudoni*, *Poria rhizomorpha*, *Sclerotinia* [*Sclerotium*] *rolfsii*, *Trametes straminea*.

Mistletoes: *Dendrophthoe falcata*, *Tapinanthus* sp. aff. *T. globifer*. King notes that plantations of this tree in West Bengal are famous examples of the destructive propensities of what he calls *Loranthus longiflorus* and especially of its var. *falcatus*.

Mollusks: *Limicolaris aureus*.

Nematodes: *Xiphinema* sp. Raman & Das report the abundance of this nematode as averaging 21 per 250 g. of forest soil.

Myriapods: *Odontopyge* sp.

Bees: *Xylocopa inconstans*.

Ants: *Atta* sp. Lamb reports leaf-cutter ants very destructive.

Beetles: *Alcidodes ludificator*, *Apion angulicollis*, *A. armipes*, *Apophylla* [*Apophyllia*] *chloroptera*, *A. nigricollis*, *A. sulcata*, *Calopepla leayana*, *Chrysolagria naivashiana*, *Curimosphaena villosus*, *Dihammus cervinus*, *Doliopygus conradti*, *Ecnomaeus planus*, *Empeccamenta calabarica*, *Lagria villosa*, *Lixus camarunus*, *L. spinimanus*, *Macrocoma candens*, *Platypus hintzi*, *Podagricina dilecta*, *Prioptera punctipennis*, *Siderodactylus sagittarius*, *Sphenoptera reticulata*, *S. zechiana*, *Xyloborus ferrugineus*, *X. fornicatus*.

Hemipterous bugs: *Agaeus pavimentatus*, *Anoplocnemis curvipes*, *A.*

tristator, *Atekocera raptoria*, *A. strictior*, *Chunrocerus niveo-sparsus*, *Dysodercus superstitiosus*, *Homoeocerus pallens*, *Tingis beelsoni*, *Trioza fletcheri*.

Isopods: *Coptotermes curvignathus*, *C. niger*, *Macrotermes goliath*. Lamb states that termites usually do little damage except sometimes to the heartwood near the ground.

Lepidopterons: *Achaea eponina*, *A. lienardi*, *Acrocercops teles-tis*, *Bunaea alcino*, *Catopsilia florella*, *Diacrisia lutescens*, *D. maculosa*, *Endoclita* [Phassus] *undulifer*, *Euchromia lethe*, *Eupterote geminata*, *E. undata*, *Gonodontis clelia*, *Imbrasia obscura*, *Indarbela quadrinotata*, *Metanastria hyrtaca*, *Myrina silenus*, *Parasa ananii*, *Phostria caniusalis*, *Pionea aureolalis*, *Psilogramma menephron*, *Sahyadrassus malabaricus*, *Selepa celtis*, *Xuleutes ceramica*.

Orthopterons: *Gryllus posticus*, *Heteropternis thoracica*, *Kraus-saria angulifera*, *Phaneroptera nana*, *Phymateus viridipes*, *Zonocerus elegans*, *Z. variegatus*.

Mammals: *Axis axis*, *Strepsiceros strepsiceros* (kudu), *Sylvicapra grimmia* (gray duiker), *Thryonomys swinderianus* (great cane rat), *Tragelaphus scriptus* (harnessed antelope).

Muchovej and his associates (1978) report *Ceratocystis fimbriata* as parasitic on *Gmelina arborea*. Kochar and his associates (1972) report that, at least in laboratory experiments, *Aedes* mosquitoes (*Stegomyia* spp.) show a marked preference to *Gmelina arborea* timber for their oviposition, second only to the timber of *Cedrus deodara*.

Govindachari and his associates (1972) report the isolation of a new tetrahydrofuranoid lignan, arboreal, from the heartwood of *Gmelina arborea*. It is a long-chain ester, 1-hydroxyl-2-methoxy-2, 6 bis (3,4-methylenedi-oxyphenyl)-3,7-dioxobicyclo [3.3.0] octane. This is said to represent the first instance of a naturally occurring tetrahydrofuranoid lignan [cluytyl ferulate] substituted at the benzylic carbon level. It is produced also in the heartwood of *Lannea grandis*.

Rao and his associates (1967) found luteolin present in the alcoholic extract of *Gmelina* leaves, while Joshi and his associates (1977) isolated from a light petroleum extract of the roots the following chemical compounds: hentriacontanol-1, a sesquiterpene, ceryl alcohol, β -sisterol, and η -octacosanol; the aqueous extract yielded gmelinol.

Anjaneyulu and his associates (1977) isolated no less than six new lignans from the heartwood. These are 6"-bromo-isoarboreol, 4-hydroxysosamin, 4,8-dihydroxysesamin, 1,4-dihydroxy-sesamin (gummadiol), 2-piperonyl-3-hydroxymethyl-4-(α -hydroxyl-3,4-methylenedioxybenzyl)-4-hydroxytetrahydrofuran, and the 4-C- β -glucoside of 4-epigummadiol.

Dymock, Warden, & Hooper (1893) report that the ash of powdered roots of *Gmelina arborea* is free of manganese. The petroleum ether extract has some slight siccative properties, contains resins and a trace of an alcoholic principle. The fruit has been found to contain butyric and tartaric acids, some astringent matter, an alkaloid, a resin, and a saccharin.

Common and vernacular names for *Gmelina arborea*, including orthographic variants, are the following: álamo blanco, álamo ofón,

anvong, anyong, arisa, ashveta, atdemmata, at-dem-mata, at-demmata, bachanige, ban, bari, batinj, bhadraparni, bhadropornni, bol-gi-ppok, bolkobak, bolko bak, candabar tree, candahar tree, cashmere tree, challagummudu, chimman, ciruela de Malaya, comb tree, coomb tree, cumbulu, cummi, dieng-lophiang, et demata, et-demata, et-demmata, eth demata, eth-demata, eth-demata, gam, gamair, gamar, gamari, gamári, gámári, gambar, gámbar, gambari, gamberi, gambhar, gámhbár, gambhári, gambhari, gamhar, gamhár, gaminea, gammari, gamri, ganghari, gandharya, gmélinea élané, gomari, gomghari, goomadee, goomar-tek, goomar teak, goombar, gopadhadrika, grishti, guma, gumadi, gumai, gumaldi, gumar, gúmar, gumartek, gúmar-tek, gumar, gumbár, gũmbar, gumbari, gumbhar, gúbhar, gumbhár, gumbharee, gumbhari, gumbhir, gumbor, gumhar, gumhár, gumhár, gúmhar, gumher, gummadi, gummudu, gumudu, gumteku, gumudu-takku, gumudu teku, gumuduteku, gumudu téku, gumur, gupsi, gupsiro, hira, imbeh-ching, Indian bulang, jemane, jobo de Africa, joogani-chookar, jugani-chukur, kainadu, kaju titi, kakodumbhari, kákódumbári, kalarbadi, kamar, kamar, kambhar, kambhari, kambhári, kambharika, kasamar, kashamari, kashmar, kashmiri, kashmaryya, Kashmir tree, Kashmir-tree, kashmori, kasmár, kasmár, kasmardaru, kasmari, kásmari, kasmaryamu, kasmiri, kasmiri-mara, kasomhardaru, kassamar, kássamar, kataphala, kattanam, khamar, khamara, khamāra, khamari, khambhari, khambhári, khammara, khamnar, krishna, krishnaphala, krishnavrintika, kshirini, kule, kuli, kull, kumadi, kumahr, kumala, kumar, kūmār, kúmār, kumara, kúmār-gambari, kumbal, kumbhar, kumbhár, kumbil, kumbili, kumbudi, kumbulu, kumhar, kumhar, kumhár, kumhár, kúmhar, kumhar tree, kumher, kumil, kumuda, kumule, kunbhir, kurasmara, kurse, kursi, kyunboc, kyúnboc, kywonpho, kywon-pho, lói, loi tho, lói tho, madhubhadra, madhumati, madhuparnika, madhurasa, mahabhadra, mahakumuda, mai-sau, Malay beechwood, Malay bush beech, Malay bushbeech, melina, modini, numbon, numbong, numbor, numbór-kúng, pedda-gomra, pedda gomru, peddagomru, peddagumudu, pedda gumudu téku, peddagumudutekku, peddah gomra, peddu gumu, perungumil, perungumpil, phang-arong, pitaphala, pitarohini, pulir-gumil, ramani, rohini, rom ma, sadabhadra, sag, sarvatobhadra, sarvatobhadrika, savan, saw, sevan, seven, sewan, sewān, sewun, shevan, shevana, shewan, shewney, shewun, shewunee, shivan, shivani, shivannigida, shiwali, shiwan, shiwani, shiwin, shíwin, shripani, sirna, sivan, sivony, snapdragon tree, snigdhaparni, sripinari, sthulatvacha, subhadra, sudridhatvacha, suphala, svarubhadra, tagoomooda, tagumúda, tall beechberry, teggummadu, teggummodu, thlan-vong, tho, tree gmelina, tree verbená, triparni, umi, umitekku, umi-thekku, vataha, vidari, vidarini, wang, wareng, white teak, yá má ne, yamanai, ya-ma-nay, yamane, yemane, yemani, yemene, and yémené.

Several authors, notably Clarke (1885), Fernandez-Villar (1880), Collett & Hemsley (1890), Trimen (1895), Hallier (1918), Ali (1932), Dop (1935), Petelot (1953), Fletcher (1938), and Cooke (1958) list *Gmelina arborea* from the Philippine Islands, but Merrill (1923) assures us that the species does not occur in these islands. Uphof (1968) records it from the "Pacific Islands", spe-

cifically Fiji, but this is doubtless also the result of a misidentification, in this case for *G. vitiensis* Seem.

It should be noted that the Roxburgh (1815) to *G. arborea* is cited as "1819" by Stapf (1930), Taylor (1959), and Trimen (1895) and as "1814" by Fletcher (1938) and Merrill (1941). The Roth (1821) reference is often mis-cited as "1825".

Among the bibliographic references said to refer to *Gmelina arborea*, but not as yet seen by me for verification are volumes 1 and 2 of a work by Charaka-Samhita, translated by A. C. Kaviratna (1718 pp., Corinthian Press, Calcutta), "The Bower Manuscript", by A. F. R. Hoernle, 1893--1912 (401 pp., Supt. Govt. Printing, Calcutta), and Kraener's "Materia Medica of Ceylon".

Material of *Gmelina arborea* has often been misidentified and distributed in herbaria as *Premna tomentosa* Willd. On the other hand, the Avery 442, Clemens 43318a, Herb. Hort. Bot. Calcut. s.n., Liogier 28476, Maxwell 76-58, Naudan 76, Nicolson 3138, and Perrottet 483 (and possibly Singh 333) are *G. arborea* var. *canescens* Haines, A. Shah s.n. [14-3-22] is the type collection of *f. dentata* Mold., Duthie 22451, Herb. Bot. Gard. Trin. 3586, Kand 4-81, Khajuria s.n. [May 14, 1928], López-Palacios 3096, Scully 191, Srinivasan s.n., Troth 755, and Vidal 5856 are var. *glaucescens* C. B. Clarke, Yip 232 is *G. chinensis* Benth., Maxwell 75-318 is *G. elliptica* J. E. Sm., and Jameson s.n. is *Callicarpa nudiflora* Hook. & Arn. Hosseus 476 is a mixture of *Gmelina arborea* and *Columbia floribunda* in the Tiliaceae. Nafday 174 does not actually indicate on the collector's label that it was collected from cultivated material, but I am assuming that it was. The label accompanying Mejla 253 states "Arbol de 3.5 cm. de alt." -- surely an error for 3.5 m.

Citations: TANZANIA: Tanganyika: Burtt 6298 (Br). MALAWI: E. Phillips 2773 (Ba--378289). PAKISTAN: Northwest States: Duthie s.n. [Dudhwa range, 8-4-98] (Gg--127012); Ibrahim s.n. [Jan. 1971] (Gz--wood sample). INDIA: Assam: Chand 1443 (Mi), 3045 (Mi), 4398 (Mi), 4603 (Mi), 7476 (Mi), 8344 (Mi); Chatterjee s.n. [May 1902] (Po--63435); Koelz 29685 (Mi), 33086 (Mi). Bihar/Orissa: Nusker 40 (Mu--3942). Gujarat: Santapau 8679 (N). Karnataka: Saldanha 12346 (W--2794840), 12824 (W--2794841), 13298 (Mi, W--2653635), 16581 (W--2653619); G. Thomson s.n. [Mysore & Carnatic] (Pd). Kerala: Hohenacker 554 (Mu--741), 757 (Mu--1603). Tamil Nadu: Perrottet 483 (V); Yeshoda 374 (N). Union Territory: Perrottet s.n. [Pondichéry 1835] (Br, W--2496330). Uttar Pradesh: U. Singh 332 (Dp--30951), 333 (La); Srinivasan s.n. [Ramnagar, Feb. 1931] (N), s.n. [Dehra Dun, June 1931] (N); Strachey & Winterbottom s.n. [Bhabar of Kumaon] (Br). State undetermined: Wight 2322 (T). SRI LANKA: Gardner s.n. [Thwaites C.P.128] (Pd, Pd); Hallier C.243 (Hg, Le), C.3514 (Hg, Le); Jayasuriya 1989 (Ac, Ld, W--2808349); Meebold 3837 (S); Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28312 (Ac, E, Gz, Kh, Ld, Pd, Pd, W--2764499); Rudolf s.n. [Feb. 1896] (Mi); Sumithraarachchi & Fernando DBS.161 (Ld, W--2803397), 663 (W--2808355); Worthington 887 (K), 2787 (K), 2824 (K), 6266 (K), 6777 (K, K). BANGLADESH: Majumder & Islam 38 (Mi), MADW.24489 (Ws, Ws). BURMA: Upper Burma: F. K. Ward 493 (N). CHINA: Yünnan: A. Henry 12886 (N--photo, W--

459348). THAILAND: *Bumphang* 1080 [Herb. Roy. For. Dept. 26234] (S); *Herb. Roy. For. Dept.* 92 (N); *Hosseus* 476 in part (Mu--4197); *Hokkamkaeng* 4 [Herb. Roy. For. Dept. 4399] (W--2064800); *Kostermans* 85 (Bz--73296); *Koyama, Phengkhlai, Niyondham, Tamura, Okada, & O'Connor* 15535 (Ac, N); *Sangkachand* 780 [Herb. Roy. For. Dept. 22711] (Gg); *Sørensen, Larsen, & Hansen* 6960 (Ld). VIETNAM: Annam: *Poilane* 13635 (B). MALAYA: Selangor: *Poore* 361 (Kl--361). GREATER SUNDA ISLANDS: Sabah: *Kadir* s.n. [Herb. N. Born. For. Dept. 971] (W--2317108); *Kanis & Sinangui* SAN.52638 (Ld). CULTIVATED: Brazil: *A. Gentry* 12805 (N); *Pereira* 366 (W--2962201). Dominica: *L. H. Bailey* 809 (Ba). Dominican Republic: *Mejía* 253 (N). Egypt: *Mahdi* s.n. [17/5/1966] (Gz, Gz). Florida: *Avery* 442 [P.2737] (Ba). Hawaiian Islands: *Herb. Haw. Sugar Pl. Assoc. Exp. Sta.* s.n. [October 13, 1940] (Bi). Honduras: *Molina* R. 27891 (Mi, N, W--2735847). India: *Herb. Hort. Bot. Calcut.* s.n. (B); *Nafday* 174 (Ba); *Roxburgh* s.n. (Br--isotype, Br--isotype, Br--isotype, F--photo of isotype, Ld--photo of isotype, N--isotype, S--photo of isotype). Java: *Herb. Hort. Bot. Bogor.* XI.1.37 (Bz--25842, Bz--25843, Bz--25844, Bz, Bz, Bz), XI.5.37 (Bz--26553, Bz--26554). Mexico: *Wendt, Villalobos C., & Olmstead* 2916 (Ld). Nicaragua: *W. D. Stevens* 20955 (Ld). Singapore: *Furtado* 385 (Ca--343115). Sri Lanka: *Moldenke, Moldenke, & Jayasuriya* 28141 (Ld, Pd, W--2764416), 28177 (Ac, Pd, W--2764451); *Moldenke, Moldenke, & Sumithraarachchi* 28200 (Gz, Ld, Ld, Pd, W--2764461). Trinidad: *W. E. Broadway Trin. Bot. Gard. Herb.* 3516 (R). Venezuela: *Marcaño-Berti* 2026 (Ld). MOUNTED ILLUSTRATIONS: *Hook., Curtis Bot. Mag.* 73 [ser. 3, 4]: pl. 4395 (Ld); *López-Palacios, Fl. Venez. Verb.* [319], fig. 76. 1977 (Ld); *H. N. Moldenke* color slide 178 (Ld).

GMELINA ARBOREA var. *CANESCENS* Haines, For. Fl. Chota Nagpur 487. 1910.

Bibliography: Haines, For. Fl. Chita Nagpur 487. 1910; Haines, Bot. Bihar Orissa, ed. 1, 4: 719. 1922; Osmaston, For. Fl. Kumaon 409. 1927; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 127 & 186. 1949; Mold., Résumé 163, 166, 218, & 456. 1959; Haines, Bot. Bihar Orissa, ed. 2, 2: 754. 1961; Mold., Résumé Suppl. 16: 9. 1961; Mold., Fifth Summ. 1: 276, 283, & 362 (1971) and 2: 879. 1971; Mold., Phytologia 28: 449 (1974), 31: 391 (1975), 34: 363 & 369 (1976), and 36: 38. 1977; Mold., Phytol. Mem. 2: 257, 262, 273, 286, 354, & 549. 1980; H. N. & A. L. Mold. in Dassan, & Fosb., Rev. Handb. Fl. Ceyl. 4: 393 & 394. 1983; Mold., Phytologia 55: 334. 1984.

This variety differs from the typical form of the species by its lower leaf-surface being merely gray-pubescent with simple hairs, not stellate-tomentose with branched hairs.

Osmaston (1927) states that this plant "occurs throughout the [Kumaon] area up to 3,000 feet. Fairly common in the Bhabar but not common in the hills". He asserts that in that area of India it flowers in March and April and fruits in May and June. Haines (1922) describes the leaves as subcoriaceous, only 3--6 inches long, the tertiary veins strongly elevated beneath, and the flower- or fruit-panicle strict, only 3--4 inches long. He lists the variety from

the Santal Parganas in Bihar/Orissa, where, he avers, "The wood is largely used for making drums. It is white, easily worked and does not warp or shrink. It should be more widely propagated." He continues with quotations from Roxburgh, Gamble, and Dutt relative to the economic uses of the plant, but these all apply to the typical form of the species, although it seems most probable that most, if not all, of the uses described for the typical form would apply also to the varieties.

Recent collectors describe this plant as a tree, 6--10 m. tall or (according to Nicolson) to 100 feet tall, nearly leafless during anthesis, the branches wide-spreading, the inflorescence-axis greenish, the flowers fragrant, the calyx greenish, and the fruit at first green, later pale lemon-yellow. The corollas are described as "red-brown, the lip yellow" on *Chand 1582*, "madder, the lip yellow" on *Koelz 29854*, "brownish, the lip yellow" on *Nicolson 3138*, "lip and throat yellow" on *Dwyer & al. 286*, "brown outside, yellow inside" on *Liogier 21476*, and "tube and lobes brown-orange, large lip and throat yellow" on *Maxwell 76-58*.

Recent collectors have encountered the plant at altitudes of 200 to 1300 meters along streams in deciduous forests, in flower from February to April and in fruit from February to June.

Clemens, in Australia, notes that there "the flowers and leaves are sought by cattle". Pereira describes the flowers as "pardas, com fauce amarelada".

The *Dwyer & al. 286* collection, from Belize, cited below, bears no indication on its accompanying label that it represents cultivated material, but I am assuming that it, like the Australian material, was taken from experimental plantations.

Material of this variety has almost uniformly been identified and distributed in herbaria as typical *G. arborea* Roxb.

Citations: NEPAL: *Nicolson 3138* (Mi, W--2571598). INDIA: Assam: *Chand 1582* (Mi); *Koelz 29854* (Mi). Chota Nagpur: *Kerr 2178a* (W--2963759). Union Territory: *Perrottet 483* (Mu--1146). Uttar Pradesh: *Naudan 76* (Ca--304519); *Qureshi s.n.* [30th March 1929] (W--1716611), *s.n.* [18th May 1929] (W--1716611), *s.n.* [12th April 1930] (W--1719649); *Singh 333* (N); *Wali 79* (W--1347686), *83* [April] (W--1347728), *83* [September] (W--1347728). West Bengal: *Mukerjee 1517* (S). BURMA: Upper Burma: *Herb. Burma For. School 101* (N). THAILAND: *Maxwell 76-58* (Ac). CULTIVATED: Australia: *M. S. Clemens 43318a* (Mi). Belize: *Dwyer, Elias, & Maxwell 286* (E--2071717). Brazil: *Pereira 366* (N). Cuba: *Eames s.n.* [April 8, 1948] (It). Dominican Republic: *A. H. Liogier 21476* (N, W--2753334). Florida: *Avery 442* (Ft--8965). India: *Herb. Hort. Bot. Calcut. s.n.* (Mu--737). Java: *Herb. Hort. Bot. Bogor. s.n.* (Bz--21047).

Gmelina ARBOREA f. juv. *DENTATA* Mold., *Phytologia* 8: 14. 1961.

Synonymy: *Gmelina rheedii* Hook., *Curtis Bot. Mag.* 74 [ser. 3, 4]: pl. 4395 in part. 1848. *Gmelina rheedi* Hook. ex Mold., *Phytol. Mem.* 2: 408 in syn. 1980

Bibliography: Hook., *Curtis Bot. Mag.* 74 [ser. 3, 4]: pl. 4395. 1848; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 1040. 1890;

Troup, Silvicult. Indian Trees 2: 770/771, fig. 294. 1921; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1040 (1946) and imp. 3, 1: 1040. 1960; Mold., Phytologia 8: 14. 1961; Hocking, Excerpt. Bot. A.5: 45. 1962; Mold., Biol. Abstr. 37: 1062. 1962; Mold., Résumé Suppl. 3: 17. 1962; Mold., Fifth Summ. 1: 276 (1971) and 2: 879. 1971; Mold., Phytol. Mem. 2: 263 & 549. 1980; Mold., Phytologia 54: 238 & 243. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 391. 1983; Mold., Phytologia 55: 334. 1984.

Illustrations: Hook., Curtis Bot. Mag. 74 [ser. 3, 4]: pl. 4395 (in color), 1848; Troup, Silvicult. Indian Trees 2: 770/771, fig. 294 (in color). 1921.

This is a juvenile form of the species seen mostly on seedlings and watersprouts from old stumps, but occasionally on mature flowering and/or fruiting trees, of no taxonomic significance. It is characterized by 2 or 3 large, lobe-like, triangular teeth on the leaf-margins. It is based on an unnumbered collection made by Azizullah Shah at Jhajra in Siwalik/Jaunsar, India, on March 14, 1922, deposited in the herbarium of the University of California at Berkeley.

The original description of *Gmelina rheedii*, as well as the accompanying illustration, indicate leaves that are either entire or lobed, the illustration showing a flowering branch with one leaf exhibiting a single lobe.

Material of this form has uniformly been distributed either as typical *G. arborea* Roxb. or as its var. *glaucescens* C. B. Clarke.

It is very possible that *G. sinuata* Link may belong here -- see my discussion under that taxon in this series of notes.

Citations: INDIA: Siwalik/Jaunsar: A. Shah s.n. [14-3-1922] (Ca--228226--type). Uttar Pradesh: Bakhsh 91 (N); R. M. Mukherjee 89 [28th April] (W--1170155), 89 [27th May] (W--1170155).

GMELINA ARBorea var. *GLAUCESCENS* C. B. Clarke in Hook. f., Fl. Brit. India 4: 582. 1885.

Synonymy: *Gmelina arborea* var. *glaucescens* C. B. Blake ex López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24 sphalm. 1979.

Bibliography: C. B. Clarke in Hook. f., Fl. Brit. India 4: 582. 1885; Haines, For. Fl. Chota Nagpur 487. 1910; Haines, Bot. Bihar Orissa, ed. 1, 4: 719. 1922; Osmaston, For. Fl. Kumaon 409. 1927; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 127 & 186. 1949; Mold., Résumé 163, 218, & 456. 1959; Haines, Bot. Bihar Orissa, ed. 2, 2: 754. 1961; Mold., Résumé Suppl. 18: 8. 1969; Mold., Fifth Summ. 1: 270, 271, 276, & 363 (1971) and 2: 879. 1971; Mold., Phytologia 23: 423 (1972), 26: 368 (1973), 28: 443 & 449 (1974), and 34: 269. 1976; López-Palacios, Fl. Venez. Verb. 318--319 & 649. 1977; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24. 1979; Mold., Phytol. Mem. 2: 256, 257, 263, 273, 354, 408, & 549. 1980; Mold., Phytologia 50: 255. 1982; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 389 & 394. 1983; Raj, Rev. Palaeobot. Palyn. 39: 356, 372, & 395. 1983; Mold., Phytologia 55: 335. 1984.

This variety differs from the typical form of the species in the

lower side of its mature leaves being glabrous and glaucous, the glaucous appearance being due to dense microscopic glands or scales which are also present but hidden by the pubescence in the other forms of the species. The tertiary veins are not elevated beneath or only slightly so and the flower- and fruit-panicle is usually large. The calyx-teeth are mostly larger and triangular.

The variety is based on an unnumbered collection by J. D. Hooker and his associates from "Subtropical Himalaya and Khasia Mts. [Assam, India], alt. 0--2000 ft.", deposited in the Kew herbarium. Clarke (1885) cites also an unnumbered Kurz collection from "Burma and Tenasserim" and notes that the variety is "Probably only the form of *G. arborea* from moist places; some N. W. Himalayan examples are intermediate between it and the type". This "intermediate" form is probably the var. *canescens* of Haines described above.

Haines (1922) avers that var. *glaucescens* is found throughout the range of the species as a whole and is more common in Bihar/Orissa than the typical form.. The var. *glaucescens* is known definitely from northern Pakistan, Nepal, and through northern India and Bangladesh to Burma, where it extends south to Tenasserim. It is rather widely cultivated in tropical Asia, Java, Florida, Germany, and elsewhere, mostly for ornament or as a specimen tree. López-Palacios (1977) lists it as cultivated in Aragua, Barinas, Bolívar, and Mérida, Venezuela.

Raj (1983) has studied the pollen of this tree on the basis of an unnumbered Kar collection from Siwalik, India, deposited in the Stockholm herbarium.

Collectors describe the plant as a large or medium-sized tree, 8--10 m. tall, the leaf-blades 6--10 inches long, basally cordate, with glands on the lower surface, and with "white spots" (Choudry 106). They have encountered it in *Bombax-Trewia* riverine forests, at 180 m to 4000 feet altitude, and record the vernacular names "gambar", "gumhar", and "so". In Sri Lanka it has been introduced in an area of 60 inches annual rainfall. Scully asserts that it is "occasionally" planted in Guam.

Material of this variety has been misidentified and distributed in some herbaria as typical *G. arborea* Roxb., *G. sinuata* Link, and even as *Hernandia* sp. On the other hand, the Bakhsh 91, distributed as *G. arborea* var. *glaucescens*, actually represents *G. arborea* f. *juv. dentata* Mold.

Citations: PAKISTAN: Northwest States: *T. Thomson* s.n. [3000 ped.] (Pd). NEPAL: *Troth* 755 (W--2826489). INDIA: Sikkim: *J. D. Hooker* s.n. [Sikkim, 1--4000 ped.] (M, Mu--736, Pd, S). Siwalik/Jaunsar: *Choudry* 106 (Pd); *Kar* s.n. (S). Uttar Pradesh: *Dorji* 35 (N); *Duthie* 22451 (Ca--269790); *Ghazanfartli* s.n. (N); *Kand* 4-81 [April] (W--1372660), 4-81 [July] (W--1372660); *Khajuria* s.n. [May 14, 1928] (W--1716393); *Shrinivasan* s.n. [Dehra Dun, Jan. 1975] (N), s.n. [Remnagar, Feb. 1975] (N). State undetermined: *Hamid* 14-81 [Kalsi] (Pd); *Khoshoo* s.n. [Dulani Chokil] (S); *Lakhera* s.n. [Duran Chokil] (S). LAOS: *Vidal* 5856 (W--2800872). CULTIVATED: Florida: *H. N. Moldenke* 21448 (Hk, Ss). Germany: *Herb. Kummer* s.n. [Hort. bot. monac. 1856.II.12] (Mu--1371), s.n. [Hort. bot. monac. 1856.I.

12] (Mu--1370). Guam: Scully 191 (W--2920686). India: Wallich 1817/5 (Pd). Java: Herb. Hort. Bot. Bogor. XI.G.80 (Bz--25789), XV.F.13 (Bz--26312). Sri Lanka: Worthington 5932 (K). Trinidad: Herb. Bot. Gard. Trin. 3516 (W--940087). Venezuela: López-Palacios 3096 (Ld, N). Zululand: Prior s.n., (Cb). LOCALITY OF COLLECTION UNDETERMINED: Herb. Torrey s.n. (T).

GMElina ASIATICA L., Sp. Pl., ed. 1, imp. 1, 2: 626. 1753 [not *G. asiatica* Auct., 1917, nor Blanco, 1837, nor Burm., 1921, nor Kurz, 1980, nor Lour., 1790, 1954, nor Schau., 1918, nor Wall., 1831].

Synonymy: *Arbuscula bisnagarica aceris folio parvo aculeata, foliis e regione binis* Pluk., Almag. Bot. Phyt. 1: pl. 14, fig. 4. 1691. *Lycium maderaspatanum indicum*, alpino putati aemulum, foliis minoribus & majoribus bijugis, & grandioribus aculeis horridis Pluk., Almag. Bot. Phyt. 5: pl. 97, fig. 2. 1700. *Dematha zeylanensis* P. Herm., Mus. Zeyl., ed. 1, 3, 9, 12, & 21. 1717. *Michelia spinosa*, floribus luteis Amman, Comment. Acad. Sci. Imp. Petrop. 8: 218--219, pl. 18. 1736. *Prunus indica sylvestris*, fructu flavo, pyriformi Burm., Thes. Zeyl. 197. 1737. *Prunus indica sylvestris*, fructu flavo pyriformi Burm., apud P. Herm. in L., Fl. Zeyl., ed. 1, 103 in syn. 1747. *Lycium maderaspatanum indicum* alpino putati aemulum, foliis minoribus (& majoribus) bijugis & grandioribus aculeis horridum Pluk., apud P. Herm. in L., Fl. Zeyl., ed. 1, 103 in syn. 1747. *Gmelina coromandelica* Burm. f., Fl. Indica 132. 1768. *Gmelina parvifolia* Roxb., Pl. Coromand. 2: 32, pl. 162. 1798. *Gmelina parviflora* Roxb. es Pers., Syn. Pl. 2: 142. 1807. *Premna parvifolia* Roth, Nov. Pl. Sp., imp. 1, 288--289. 1821. *Gmelina inermis* Wight ex Wall., Numer. List 87, no. 1816D. 1831 (not *G. inermis* Blanco, 1837, nor Naves, 1880, 1918). *Michelia spinosa* Amman apud Schau. in A. DC., Prodr. 11: 679 in syn. 1847. *Gmelina coromandeliana* Burm. apud Schau. in A. DC., Prodr. 11: 679 in syn. 1847. *Gurelina asiatica* L. ex Wight, Illust. Indian Bot. 2: pl. 174. 1850. *Gmelina parvifolia* Sch. ex Miq., Fl. Ned. Ind. 2: 867 in syn. 1858. *Premna parvifolia* Roth apud Miq., Fl. Ned. Ind. 2: 866--867 in syn. 1858. *Arbuscula bismagarica* Pluk. apud Miq., Fl. Ned. Ind. 2: 867 in syn. 1858. *Gmelina coromandeliana* Burm. f. apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 582 in syn. 1885. *Gmelina coromandelina* Burm. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039 in syn. 1893. *Gmelina parviflora* Pers. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 in syn. 1893. *Gmelina integrifolia* Hunter, Journ. Straits Br. Roy. Asiat. Soc. 53: 101--102. 1909. *Lycium maderaspatanum* Pluk. apud H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 69 in syn. 1921. *Gmelina asiatica* var. *typica* Bakh. ex Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 69. 1921. *Gmelina coromandelica* Burm. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 69 in syn. 1921; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074 in syn. 1932. *Prunus indica sylvestris fructu flavo, pyriforme* Burm., ex Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074 in syn. 1932. *Gmelina purvifolia* Roxb. ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947. *Gmelina tomentosa* Roxb. ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947 [not *G.*

tomentosa Fletcher, 1938, nor Wall., 1817). *Premna indica et sylvestris* Burm. ex Pételot, Pl. Méd. Camb. Laos Viet. 2: 252 in syn. 1954. *Premna indica* Burm. apud Pételot, Pl. Méd. Camb. Laos Viet. 4: 151 in syn. 1954. *Premna sylvestris* Burm. apud Pételot, Pl. Méd. Camb. Laos Viet. 4: 151 in syn. 1954. *Prunus indica sylvestris* Burm. ex Mold., Résumé 341 in syn. 1959. *Gmelina asiatica* var. *typica* H. J. Lam ex Mold., Phytol. Mem. 2: 408 in syn. 1980.

Bibliography: Pluk., Almag. Bot. Phyt. 1: pl. 14, fig. 4 (1691) and 5: 234, pl. 97, fig. 2. 1700; P. Herm., Mus. Zeyl., ed. 1, 3, 9, 12, & 21. 1717; Pluk., Op. Omn. 5: 234, pl. 97, fig. 2. 1720; Amman, Comment. Acad. Sci. Imp. Petrop. 8: 218--219, pl. 18. 1736; J. Burm., Thes. Zeyl. 197. 1737; Rumpf, Herb. Amboin. 1: pl. 40 (1741) and 2: 127. 1741; P. Herm. in L., Fl. Zeyl., ed. 1, 103--104 (1747) and ed. 2, 103--104. 1748; L., Sp. Pl., ed. 1, imp. 1, 2: 626. 1753; Stickm. in L., Herb. Amb. 9. 1754; L., Amoen. Acad. 4: 121. 1759; N. L. Burm., Fl. Indica 132, pl. 39. 1768; [Retz.], Nom. Bot. 154. 1772; J. A. Murray in L., Syst. Veg., ed. 12, 564. 1784; Gaertn., Fruct. Sem. Pl. 1: 268, pl. 56, fig. 5. 1788; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 944. 1789; Lour., Fl. Cochinch., ed. 1, 2: 376--377 (1790) and ed. 2, 2: 456--457. 1793; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 2, 2: 944. 1796; Raeusch., Nom. Bot., ed. 3, 173. 1797; Roxb., Pl. Coast Coromand. 2: 32, pl. 162. 1802; J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 1 & 3. 1810; Ainslie, Mat. Med. Hindust., ed. 1, 94. 1813; Roxb., Hort. Beng., imp. 1, 46. 1814; Horsfield, Verh. Bat. Gen. 8: [Med. Pl. Java] 110. 1816; Pers., Sp. Pl. 3: 357--358. 1819; Poir. in Lam., Tabl. Encycl. Meth. Bot. [Illust. Gen.] 3: pl. 542. 1819; Roth, Nov. Pl. Sp., imp. 1, 288--289. 1821; Link, Enum. Hort. Berol. 2: 128. 1822; Blume, Cat. Gewass., imp. 1, 83. 1823; Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 45. 1824; Ainslie, Mat. Med. Indica, ed. 2, 2: 240--242. 1826; Blume, Bijdr. Fl. Ned. Ind. 14: 814. 1826; Sweet, Hort. Brit., ed. 1, 1: 323. 1826; Wall., Numer. List 49 [=50], no. 1818. 1829; Loud., Hort. Brit., ed. 1, 245. 1830; Sweet, Hort. Brit., ed. 2, 417. 1830; Wall., Numer. List 82 & 87, no. 1816D & 2654. 1831; Cham., Linnaea 7: 109. 1832; Loud., Hort. Brit., ed. 2, 245. 1832; Roxb., Fl. Indica, ed. 2, imp. 1, 3: 87--88. 1832; Blanco, Fl. Filip., ed. 1, 493. 1837; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; J. Grah., Cat. Pl. Bomb. 158. 1839; Loud., Hort. Brit., ed. 3, 245. 1839; D. Dietr., Syn. Pl. 3: 613 & 614. 1843; Hassk., Cat. Pl. Hort. Bot. Bogor. Cult. 2: 135. 1844; Voigt, Hort. Suburb. Calc. 470. 1845; Walp., Repert. Bot. Syst. 4: 97--98. 1845; Zoll. & Moritz, Syst. Verz. 52. 1846; Schau. in A. DC., Prodr. 11: 638 & 679. 1847; Wight, Illust. Indian Bot. 2: 217, pl. 174. 1850; Schnitzl., Iconog. Fam. Nat. Reg. Veg. 2: 137 Verbenac. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 200 & 365. 1858; Miq., Fl. Ned. Ind. 2: 866--867. 1858; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 244. 1861; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.] 2: 157 (1862) and 3: 255. 1863; Beddome, For. Man Bot. S. India 172. 1873; Brandis, For. Fl. Northw. Cent. India 3: 364 & 365. 1874; Roxb., Fl. Indica, ed. 2, imp. 2, 487--488. 1874; Kurz, Prelim. Rep. For. Veg. Pegu App. A: xcvi (1875) and B: 70--71. 1875; Kurz, For. Fl. Brit. Burma 2: 265.

1877; Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: Nov. App. 159.
 1880; Gamble, Man. Indian Timb., ed. 1, 295 & 509. 1881; Vidal, Sin.
 Fam. Gen. Pl. Leñ. Filip. [Introd. Fl. For. Filip.] 2: 36, pl. 75,
 fig. E. 1883; C. B. Clarke in Hook. f., Fl. Brit. India 4: 581 &
 582. 1885; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat.
 Flow. Pl. Ceyl.] 69. 1885; Hillebr., Fl. Haw. Isls., imp. 1, 340.
 1888; Watt, Dict. Econ. Prod. India 3: 516--517. 1889; Collett &
 Hemsl., Journ. Linn. Soc. Lond. Bot. 28: 110. 1890; Greshoff, Teysmannia 1: 127. 1890; Baill., Hist. Pl. 11: 94. 1891; Burck, Ann.
 Jard. Bot. Buitenz., ser. 1, 10: 98. 1891; Holmes, Bull. Pharm. 6:
 109. 1892; Dymock, Warden, & Hooper, Pharmacog. Indica, imp. 1, 3:
 72--73. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1:
 1039 & 1040 (1893) and imp. 1, 2: 622. 1894; Anon., Gard. Chron.,
 ser. 3, 15: 746. 1894; Nairne, Flow. Pl. West. India 246. 1894;
 Talbot, Syst. List Trees Shrubs Bomb., ed. 1, 161 & 221. 1894; Briq.
 in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895;
 Trimen, Handb. Fl. Ceyl. 3: 355. 1895; Woodrow, Journ. Bomb. Nat.
 Hist. Soc. 12: 359. 1899; L. H. Bailey, Cyclop. Am. Hort. 2: 654.
 1900; Koord. & Valet., Meded. Lands Plant. Bat. 42 [Bijdr. Booms.
 Java 7]: 196--197. 1900; Raciborski, Ann. Jard. Bot. Buitenz. 17
 [ser. 2, 2]: 23--24, fig. 11. 1900; Boorsma, Bull. Inst. Bot. Bui-
 tentz. 14: 35. 1902; Gamble, Man. Indian Timb., ed. 2, imp. 1, 537 &
 778. 1902; Prain, Bengal Pl., imp. 1, 1: 829. 1903; T. Cooke, Fl.
 Presid. Bomb., ed. 1, 3: 424 & 425. 1905; E. D. Merr., Bull. Bur.
 Govt. Lab. Philip. 27: 68. 1905; Talbot, Syst. List Trees Shrubs
 Bomb., ed. 2, 269. 1905; Brandis, Indian Trees, imp. 1 & 2, 509
 (1906) and imp. 2a, 509. 1907; Holtermann, Einfl. Klimas pl. 7, fig.
 40. 1907; Nieuwemhuis, Ann. Jard. Bot. Buitenz. 21: 260--261, pl. 21,
 fig. 16 & 18. 1907; Gamble in King & Gamble, Journ. Asiat. Soc.
 Beng. 74 (2 extra): 823--824. 1908; Hunter, Journ. Straits Br. Roy.
 Asiat. Soc. 53: 101--102. 1909; Talbot, For. Fl. Bomb., ed. 1, 2:
 348 & 350. 1909; Woodrow, Gard. Trop., imp. 1 & 2 [Gard. India, ed.
 6, imp. 7 & 8], 441. 1910; Brandis, Indian Timb., imp. 3, 509. 1911;
 Duthie, Fl. Upper Gang. Plain, ed. 1, 2: 221. 1911; Gerth van Wijk,
 Dict. Pl.-names, imp. 1, 1: 596. 1911; Wehmer, Pflanzenst. 1: 648.
 1911; J. C. & M. Willis, Parad. Man. Bot. 2: [Rev. Cat. Flow. Pl.
 Ceyl., ed. 1] 69. 1911; Prain, Ind. Kew. Suppl. 4, imp. 1, 98. 1913;
 Gibbs, Journ. Linn. Soc. Lond. Bot. 42: 123. 1914; Dop, Bull. Soc.
 Bot. France 61: 321. 1915; Gerth van Wijk, Dict. Pl.-names, imp. 1,
 2: 584. 1916; E. D. Merr., Interpret. Rumph. Herb. Amb. 454. 1917;
 Basu, Indian Med. Pl., imp. 1, 3: 3, pl. 738b. 1918; Firminger, Man.
 Gard. India, ed. 6, 2: 385. 1918; H. Hallier, Meded. Rijks Herb.
 Leid. 37: 58--60. 1918; E. D. Merr., Sp. Blanc. 333--334. 1918;
 H. J. Lam, Verbenac. Malay. Arch. 216, 217, 221--223, 227, 365, &
 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3,
 3: 65 & 69. 1921; Brandis, Indian Trees, imp. 4, 509. 1921; E. D.
 Merr., Bibliog. Enum. Born. Pl. 515. 1921; E. D. Merr., Philip.
 Journ. Sci. Bot. 19: 377. 1921; Gamble, Man. Indian Timb., ed. 2,
 imp. 2, 537 & 778. 1922; Haines, Bot. Bihar Orissa, ed. 1, 4: 719
 & 720. 1922; Rodger in Lace, List Trees Shrubs Burma, ed. 2, 131.
 1922; E. D. Merr., Enum. Philip. Flow. Pl. 3: 400. 1923; Ridl., Fl.

Malay Penins. 2: 622--623. 1923; Gamble, Fl. Presid. Madras 6: 1097 & 1098. 1924; Haines, Bot. Bihar Orissa, ed. 1, 6: 1296. 1924; L. H. Bailey, Stand. Cyclop. Hort., imp. 1, 2: 1353. 1925; Thakar, Fl. Cutch 223. 1926; Heyne, Nutt. Plant. Ned. Ind., ed. 2, 1: 24 (1927), ed. 2, 2: 1320 (1927), and ed. 2, 3: 1646. 1927; L. H. Bailey, Stand. Cyclop. Hort., imp. 2, 2: 1353. 1930; Stapf, Ind. Lond. 3: 299. 1930; Rodger in Lace, List Trees Shrubs Burma, ed. 3, 202. 1931; Wehmer, Pflanzenst. 2: 1024. 1931; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; P'ei, Mem. Sci. Soc. China 1 (3): 115, 116, & 119--120. 1932; L. H. Bailey, Stand. Cyclop. Hort., imp. 3, 2: 1353. 1933; Crevost & Pételot, Bull. Econ. Indo-chine 37: 1294 & 1295. 1934; Junell, Symb. Bot. Upsal. 4: 91 & 92, fig. 140 & 141. 1934; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1932 & 1934--1935, pl. 738b. 1935; L. H. Bailey, Stand. Cyclop. Hort., imp. 4, 2: 1353. 1935; Dop in Lecomte, Fl. Gén. Indo-chine 4: 842 & 845--846. 1935; E. D. Merr., Trans. Am. Phil. Soc., ser. 2, 24 (2): [Comment. Lour.] 335. 1935; Docters van Leeuwen, Blumea 2: 262. 1937; Fletcher, Kew Bull. Misc. Inf. 1938: 204--205, 404, & 422--424. 1938; Chun, Sunyats. 4: 268. 1940; Mold., Suppl. List Comm. Vern. Names 2--5, 8--11, & 13. 1940; Mold., Suppl. List Inv. Names 3. 1941; Worsdell, Ind. Lond. Suppl. 1: 441. 1941; Mold., Alph. List Inv. Names 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 53--57, 59, 60, 61, 63, 64, 66, & 93. 1942; Menninger, Descr. Cat. Flow. Trop. Trees 16. 1944; Mold., Phytologia 2: 103. 1945; Savage, Cat. Linn. Herb. 107. 1945; Blume, Cat. Gewass., imp. 2, 83. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039 & 1040 (1946) and imp. 2, 2: 622. 1946; Menninger, 1947 Cat. Flow. Trees 19. 1946; Razi, Journ. Mysore Univ. 7 (4): 64. 1946; Mold., Alph. List Inv. Names Suppl. 1: 10. 1947; Neal, In Gard. Haw., ed. 1, imp. 1, 635. 1948; Van Rennselaer, Trees Santa Barbara, ed. 2, 169. 1948; Aggarwal & Soni, Journ. Sci. Indust. Res. [India] 8B: 49--51. 1949; Aggarwal & Soni, Chem. Abstr. 43: 5611--5612. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 123--125, 127--130, 132, 136, 137, 139, 143, 144, 146, 147, 160, & 186. 1949; Neal, In Gard. Haw., ed. 1, imp. 2, 635. 1949; Menninger, Winter 1950 Seed List. 1950; Corner, Wayside Trees, ed. 2, 702 & 703. 1952; Joshi & Magar, Journ. Sci. Indust. Res. [India] 11B: 26. 1952; Roig, Dicc. Bot. Nom. Vulg. Cub. 550. 1953; Pételot, Pl. Méd. Camb. Laos Viet. 2 [Archiv. Recherch. Agron. Fast. Viet. 18]: 252 (1953) and 4: 10, 48, 64, 119, 151, 217, & 247. 1954; Mold., Journ. Calif. Hort. Soc. 15: 86. 1954; Chopra, Nayar, & Chopra, Gloss. Indian Med. Pl. 126. 1956; Sastri, Wealth India 4: 156. 1956; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 1, 2: 504 & 505. 1958; Prain, Ind. Kew. Suppl. 4, imp. 2, 98. 1958; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 75, 157--159, 163, 165--167, 170, 176, 178, 180, 188, 190, 193, 197, 218, 234, 277, 296--298, 319, 320, 339, 341, & 456. 1959; Sebastine, Bull. Bot. Surv. India 1: 95. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039 & 1040 (1960) and imp. 3, 2: 622 & 1975. 1960; Puri, Indian For. Ecol. 2: 406. 1960; Cave, Ind. Pl. Chromos. Numb. 2: 136. 1961; Gupta & Marlange, Trav. Sect. Sci. Inst. Franç. Pond. 3 (1): 79. 1961; Haines, Bot. Bihar Orissa, ed. 2, 2: 754 & 755. 1961; Hund-

ley & Ko in Lace, List Trees Shrubs Burma, ed. 3, 202. 1961; Satmoko, Malay. Nat. Journ. Spec. Issue 120. 1961; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Veg. Map Ser. 1: 20. 1962; Gerth van Wijk, Dict. Pl.-names, imp. 2, 1: 596 (1962) and imp. 2, 2: 584. 1962; Mold., Résumé Suppl. 3: 25 & 28. 1962; Nair & Rehman, Bull. Nat. Bot. Gard. Lucknow 76: 16--18. 1962; B. Singh, Bull. Nat. Bot. Gard. Lucknow 69: 57. 1962; Sobti & Singh, Proc. Indian Acad. Sci. B.54: 143. 1962; Legris, Trav. Sect. Sci. Inst. Franç. Pond. 6: 252, 527, 530, & 567. 1963; Maheshwari, Fl. Delhi 282. 1963; Prain, Beng. Pl., imp. 2, 2: 619. 1963; Ramamurthy, Bull. Bot. Surv. India 5: 261 & 264. 1963; Rao, Aggarwal, & Mukherjee, Bull. Bot. Surv. India 5: 315. 1963; Cave, Ind. Pl. Chromos. Numb. 2: 330. 1964; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Veg. Map Ser. 2: 15. 1964; Mold., Resume Suppl. 11: 6. 1964; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 244. 1964; Bose, Handb. Shrubs 9, 10, 52, 53, 108, & 121. 1965; Marlange & Meher-Homji, Journ. Indian Bot. Soc. 44: 175. 1965; Neal, In Gard. Haw., ed. 2, 721 & 730. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 46. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 1105--1106. 1966; J. L. Ellis, Bull. Bot. Surv. India 8: 337. 1966; Gaussen & al., Trav. Sect. Sci. Tech. Inst. Franç. Pond. Hors 7: 24, 25, 28, & 99. 1966; Naithani, Bull. Bot. Surv. India 8: 259. 1966; Ramaswami, Study Flow. Pl. Bangalore [thesis] xxiii, xxix, 1032--1034, & 1412. 1966; Sebastine & Ramamurthy, Bull. Bot. Surv. India 8: 180. 1966; Venkatesan, Indian For. 92: 29. 1966; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 2, 2: 504 & 505. 1967; Gaussen, Legris, & Viart, Indian Counc. Agr. Res. Veg. Map Ser. 4: 16. 1967; Mold., Résumé Suppl. 15: 9. 1967; Ramaswamy, Bull. Bot. Soc. Beng. 21: 89 & 96. 1967; Sebastine & Ellis, Bull. Bot. Surv. India 9: 197. 1967; Srivastava, Quart. Journ. Crude Drug Res. 7: 1053. 1967; Vajravelu & Rathakrishnan, Bull. Bot. Surv. India 9: 43. 1967; D. & E. Venkata Rao & Viswanadham, Curr. Sci. [India] 36: 72. 1967; Gunawardena, Gen. Sp. Pl. Zeyl. 147. 1968; Mold., Résumé Suppl. 16: 9 & 22. 1968; Panigrahi & Saran, Bull. Bot. Surv. India 10: 55 & 58. 1968; Bolkhov., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 715. 1969; R. N. & I. C. Chopra & Varma, Suppl. Gloss. Indian Med. Pl. 33. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Ind. 6: 264. 1969; Preston in Syngé, Suppl. Dict. Gard. 903. 1969; Rau, Bull. Bot. Surv. India 10, Suppl. 2: 62. 1969; Singh, Bull. Bot. Surv. India 11: 15. 1969; Matthew, Bull. Bot. Surv. India 12: 88. 1970; Menninger, Flow. Vines dust-jacket, 334, & fig. 194. 1970; Brandis, Indian Trees, imp. 5, 509. 1971; Fonseka & Vinasithamby, Prov. List Local Names Flow. Pl. Ceyl. 16, 27, 48, & 63. 1971; Gerth van Wijk, Dict. Pl.-names, imp. 3, 1: 596 (1971) and imp. 3, 2: 584. 1971; Inamdar & Patel, Indian For. 97: 328. 1971; M. A. Martin, Introd. Ethnobot. Camb. 142. 1971; Mold., Fifth Summ. 1: 129, 264, 265, 268, 276, 280, 281, 283, 289, 296, 301, 305, 324, 330, 350, 363, 391, & 475 (1971) and 2: 523, 524, 526, 569, 572, 609, 614, 879, 880, & 972. 1971; Patel, For. Fl. Gujarat 229 & 230. 1971; Roxb., Fl. Indica, ed. 2, imp. 3, 487--488. 1971; C. D. Adams, Flow. Pl. Jamaic. 627 & 819. 1972; Dymock, Warden, & Hooper, Pharmacog. Indica, imp. 2, [Hamdard 15:] 72--73 & 348--349. 1972; Gamble,

Man. Indian Timb., ed. 2, imp. 3, 537 & 778. 1972; Mold., Phytologia 23: 432. 1972; Hegnauer, Chemotax. Pfl. 6 [Chem. 21]: 677. 1973; Mold., Phytologia 26: 365 & 368. 1973; R. R. Rao, Stud. Flow. Pl. Mysore Dist. [thesis] 2: 751. 1973; Rao & Razi, Journ. Mysore Univ. B. 26: 71, 102, 194, & 196. 1973; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 715. 1974; Gibbs, Chemotax. Flow. Pl. 3: 1794. 1974; Mold., Phytologia 28: 446 & 449. 1974; Basu, Indian Med. Pl., imp. 3, pl. 738. 1975; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: 1932 & 1934--1935, pl. 738b. 1975; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Mold., Phytologia 31: 398 & 406 (1975) and 32: 47. 1975; Molina R., Ceiba 19: 96. 1975; Roth, Nov. Pl. Sp., imp. 2, 288--289. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Anon., Biol. Abstr. 61: ACL.619. 1976; L. H. & E. Z. Bailey, Hortus Third 515--516. 1976; Mold., Phytologia 34: 263, 265, 269, & 275. 1976; Srivastava, Fl. Gorak. 252 & 255. 1976; Talbot, For. Fl. Bomb., ed. 2, 2: 348 & 350. 1976; Chin, Gard. Bull. Singapore 30: 195. 1977; Subramanian & Kalyani, Indian For. 103: 113 & 117. 1977; Sharma, Shetty, Vivekan., & Rathakr., Journ. Bomb. Nat. Hist. Soc. 75: 33. 1978; Sprangers & Balasubram., Trop. Ecol. 19: 85, 86, & 92/93. 1978; Jayasuriya, Stud. Fl. Ecol. Ritig. 197. 1980; Mold., Phytol. Mem. 2: 122, 253, 254, 263, 268, 270, 273, 279, 286, 289, 290, 293, 296, 315, 320, 341, 354, 408, 422, 433--435, & 549. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980; Brenan, Ind. Kew. Suppl. 16: 130. 1981; Hillebr., Fl. Haw. Isls., imp. 2, 340. 1981; Varma, Fl. Bhagalpur Dicot. 306--307. 1981; Mold., Phytologia 50: 252, 261, & 370 (1982) and 54: 239, 243, & 249. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 327, 390, & 394--399. 1983; Mold., Phytologia 55: 42, 327, 329, & 335. 1984.

Illustrations: Pluk., Almag. Bot. Phyt. 1: pl. 14, fig. 4 (1691) and 5: pl. 97, fig. 2. 1700; Pluk., Op. Omn. 5: pl. 97, fig. 2. 1720; Amman, Comment. Acad. Sci. Imp. Petrop. 8: pl. 18. 1736; Roxb., Pl. Coast Coromand. 2: pl. 162. 1802; Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 3: pl. 542. 1819; Wight, Illust. Indian Bot. 2: pl. 174 (in color). 1850; Vidal, Sin. Fam. Gen. Pl. Leñ. Filip. [Introd. Fl. For. Filip.] 2: pl. 75E. 1883; Raciborski, Ann. Jard. Bot. Buitenz. 17 [ser. 2, 2]: 24, fig. 11. 1900; Holtermann, Einfl. Klimas pl. 7, fig. 40. 1907; Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21 [ser. 2, 5]: pl. 21, fig. 16 & 18. 1907; Basu, Indian Med. Pl., ed. 1, 3: pl. 738b. 1918; Crevost & Pételot, Bull. Econ. Indo-chine 37: opp. 1294. 1934; Junell, Symb. Bot. Upsal. 1 (4): 91, fig. 140 & 141. 1934; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: pl. 738b. 1935; Sastri, Wealth India 4: 156, fig. 73. 1956; Nair & Rehman, Bull. Bot. Gard. Lucknow 76: 23, fig. 10. 1962; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: pl. 738b. 1975.

A large, straggling or scrambling, mostly deciduous (evergreen, according to Corner) bush or bushy shrub, sometimes climbing, very variable in size and habit, often weak, arching or flopping over adjacent shrubs, flat-topped, rather hardy, to about 3 or 4 m. tall, or rarely (when adult) a semi-evergreen tree to 10 m. tall, sometimes even prostrate, usually spiny (especially when young), some-

times entirely unarmed [f. *inermis* (Wight) Mold.], much-branched with basitonic branching; branches decussate-opposite, flexible, yellow-lenticellate, forming flat sprays, often with several main stems crowded together; bark yellowish- or brownish-white, thin, smooth; wood hard, gray, the pores moderate in size, scanty, in groups or short concentric lines, the medullary rays fine, short, regular, not numerous; branchlets horizontal, rigid, often compressed, puberulent or even villosulous when young; twigs frequently much abbreviated and apically spinose, the axillary spines sometimes leaf-bearing; crown spreading; leaves small, decussate-opposite, anisophyllous (one larger than the other in a pair), caducous or early deciduous (reportedly sometimes evergreen or semi-evergreen); petioles 0.5--3 (mostly about 6 mm.) cm. long, slender; leaf-blades membranous or chartaceous, varying from oval or ovate to elliptic, obovate, subrhomboid, or triangular in outline, very variable, mostly 1--9.5 (rarely to 13) cm. long, 1.5--6 cm. wide, sometimes all only 4--10 mm wide and 1--2.5 cm. long [f. *parvifolia* (Roxb.) Mold.], entire or sometimes irregularly and more or less obscurely 1-lobulate, basally mostly acute to cuneate, sometimes rounded, apically acute or obtuse, glabrous or subglabrous on both surfaces when mature, often more or less pubescent when young, dark and shiny above, pale-green, glaucescent, and minutely white-glanduliferous beneath, the glands round, not nectariferous, about 20 per leaf; inflorescence axillary and terminal, racemiform or paniculate, nodding to more or less pendulous, densely pubescent to tomentose or appressed-tomentose, ten to many-flowered; bracts usually rather small, linear or lanceolate, 2 or 3 times as long as the calyx, apically cuspidate, caducous, occasionally large and leafy; flowers large, borne in short or very short 1--5-flowered cymules in mostly terminal, fulvous-tomentose, racemiform panicles 2.5--5 cm. long, caducous, falling after dawn or as soon as picked during daylight hours; peduncles pubescent; calyx cupuliform, about 3--4 mm. long, somewhat contracted apically, externally pubescent-tomentose (the hairs dark-brown and strigose-appressed), glanduliferous, internally glabrous, the rim truncate, very shortly and obscurely 4-toothed, the teeth very small, triangular, apically acute, the nectariferous glands 2 to many, large, bare, antrorse, flattened, discoid; corolla large, yellow or bright-yellow to bright sulphur-yellow or jasmine-yellow, *Allamanda*-like, infundibular and bilabiate, 4--5 cm. long, tetramerous, externally finely pubescent or reddish-tomentose with appressed strigose hairs, internally glabrous, the tube basally narrow and curvate, apically ampliate into a broadly ventricose throat, the limb unequally to almost equally 4-lobed, the lobes ovate, apically subacute, the lowest largest, the upper reflexed; fertile stamens 2, to 12 mm. long; staminodes 2, 5 mm. long; style shortly exserted, 2.5--3.5 cm. long; pollen-grains 3-zonicolporate, subprolate, often syncolpate, $39 \times 27 \mu$ (range 39×25 -- 30μ), the endocolpium very faint, the ectine surface reticulate or areolate; fruit drupaceous, ovoid or obovoid-pyriform to subglobose, yellow when ripe, with a watery or soapy exudate, 1.5--2.8 cm. long, externally glabrous, 1- or 2-celled and -seeded; chromosome number: $n = 19$ or 20 , $2n = 38$ or 40 .

This is a widely distributed and apparently highly variable species found from India, Sri Lanka, and Bangladesh, through Burma and Thailand, to Malaya and Indochina, east to Indonesia, north to southern China, and west (probably only naturalized) to Réunion and Mauritius. It is widely cultivated in various parts of North, Central, and South America, the West Indies, Europe, Asia, and Africa, as well as on some Pacific islands like Hawaii, mostly as a specimen tree in botanical gardens. In a few cases it appears to have become locally naturalized to a limited extent.

The species is based on *Herb. Linnaeus 780/2* in the Linnean Herbarium in London. The lower chromosome count, noted above, is reported by Cave (1961), the higher count by Sobti & Singh (1962). It is to be hoped that herbarium vouchers were made of their material so that the identification can be checked.

It should be noted here that the *G. asiatica* credited to "Auct. (1917)", to Burman (1921), and to Kurz (1902) are synonyms of *G. elliptica* J. E. Sm., while the *G. asiatica* credited to Blanco (1837), to Lam (1980), to Loureiro (1954), to Schauer (1918), and to Wallich (1831) are synonyms of *G. philippensis* Cham. *Gmelina tomentosa* Fletcher (1938) is a valid species, and *G. asiatica* Wallich (1817) belongs in the synonymy of *G. arborea* Roxb. The *Gmelina inermis* of Blanco (1837) is *G. elliptica* J. E. Sm., while the *G. inermis* of Naves (1800) is actually a synonym of *G. philippensis* Cham., although both are often cited in the synonymy of *G. asiatica* L. The *Gmelina hystrix* Kurz, also sometimes included in the synonymy of *G. asiatica* L., actually belongs in that of *G. philippensis* Cham. The *G. asiatica* var. *philippinensis* of Bakhuizen also is a synonym of *G. philippensis*, while *G. asiatica* var. *villosa* of Bakhuizen is *G. elliptica* J. E. Sm.

In connection with the nomenclatural typification of *Gmelina asiatica* L. it should be noted that *Herb. Linnaeus 780/1* is labeled as *G. asiatica*, but actually is a specimen of *G. elliptica* J. E. Sm.; *Herb. Linnaeus 780/2* bears the written comment "*Gmelina*, cand. foliis" in Smith's handwriting, followed by "*asiatica* vera JES// *Jambosa sylvestris parvifolia* Rumph. amb. 1. p. 129. t. 40." *Herb. Linnaeus 780/3* actually is *Flacourtia indica*, but is labeled as "*Gmelina indica* Burm. Ind. 132."

The *Gmelina asiatica* f. *inermis* (Wight) Mold., *Phytologia* 55: 42 (1984), f. *parvifolia* (Roxb.) Mold., *Phytologia* 55: 42 (1984), and f. *integrifolia* Mold. [laminis foliorum semper marginaliter integris] appear to represent growth forms of slight, if any, taxonomic significance. The first of these represents plants entirely without spines, the second is a form with the mature leaf-blades only 1--2.5 cm. long and 4--10 mm. wide, and the third is a form whose leaf-blades are uniformly unlobed.

Collectors have described *Gmelina asiatica* on the labels accompanying their specimens as a tall, spreading or tangled, rigid, odorless shrub, 1.5--3 m. tall, or as a much-branched bush, the trunks and branches very spiny, the branching basitonic, the "stems flattened, grooved on both sides" (according to Mueller-Dombois & Comanor), the leaves glabrous, the flowers large, zygomorphic, pendulous, the corolla 2-lipped, the upper lip 3-lobed, "falling after

dawn", tubular, incurved, with the lip directed upwards, the "petals overlapping to form an umbrella over the flower" (according to Henry), the fertile stamens 2, the sterile stamens 2, and the fruit pyriform, green to greenish-yellow or green with whitish spots when immature, yellow when mature, the inner pericarp juicy, with a watery or soapy exudate, 1-seeded. The pollen has been described in detail by Nair & Rehman (1962) based on *Herb. Nat. Bot. Gard.* 1235 pollen slide no. 2696.

Collectors report encountering this plant in dry sandy areas, in dry undergrowth vegetation, in scrub, along hedges, in rocky ground of open deciduous forests, near rivers and on riverbanks, in scrubby deciduous forests, on the bund of tanks, near rock outcrops, in roadside jungles, on sandy exposed soil, and in clay-sand soil of shrub borders, from sealevel to 950 m. altitude, in anthesis from March to January, in fruit from April to August, as well as in October, December, and January. Undoubtedly it flowers throughout the year in its native haunts, and probably also fruits throughout the year, as, indeed, is asserted by Menninger (1970). Cooke (1905) asserts that in the Bombay area it flowers "more or less throughout the year". Pearsall describes it as a "shrubby plant growing almost vine-like"; Sumithraarachchi refers to it as a "common shrub" in Sri Lanka, where Cramer also refers to it as "common in scrub". Cramer, curiously, refers to "pod 6-seeded", probably due to an error in transcription when the labels were prepared. Worthington, also in Sri Lanka, speaks of finding it in areas of 60--90 inch annual rainfall, "but also in scrub in the dry zone and common around the shallow ends of tanks". My wife and I found it scattered at the edge of the jungle near lakeshores. Cooray refers to it as "common". It is described as a nannophyte (Ramamurthy, 1963) or nannophanerophyte (Razi, 1946) in the Raunkiaer classification of life forms.

The corollas are described as "yellow" on *Amaratunga* 455 & 1357, *Comanor* 829 & 833, *Cooray* 10031709R & 68102103R, *Davidse* 7406, *Fennell* 1003, *Fosberg & Sachet* 53 & 58, *Gould & Cooray* 13666, *Henry* 166, *Hladik* 821, *Liang* 79141, *Moldenke & al.* 28226, *Mueller-Dombois & Comanor* 67062307, *Nafday* 118, *Sumithraarachchi* 164, and *Worthington* 5325, "bright-yellow" on *Bernardi* 14357, *Comanor* 592, *Cramer* 4673, *Fosberg* 50237, *Fosberg & Sachet* 52959 & 53060, and *Fosberg & al.* 50933, as "bright sulphur yellow" on *Amaratunga* 318 & 1627, as "jasmine yellow" on *Townsend* 73/41, and as "RHS [Royal Horticultural Society] Straw Yellow 604/404/1" on *Peele* 1389.

The nectariferous glands are described in detail by Nieuwenhuis (1907). He avers that the large calycinal ones are regularly visited by ants: "Die Zuckerausscheidung findet auf einer einfachen Schicht von Palisadenzellen statt." He avers that he never at all observed any ants visiting the small foliar glands and also never observed, either in the field or in the laboratory, any actual sugar secretion from them. He reports ants regularly visiting flower-buds, while sunbirds definitely service the open flowers. Burck observed perforation of the corolla-tubes made by pilfering bees and wasps, but Nieuwenhuis claims that he never saw any evidence of such activity. The same sunbirds that service this tree also service *Bignonia regalis*. Caterpillars do only insignificant damage to the leaves.

Most authors and collectors describe *Gmelina asiatica* as a thorny or spinescent shrub., e.g. Varma (1981), Matthew (1970), and Patel (1971). Jayasuriya refers to it as having the "branchlets spinous at the ends". The Baileys (1976) describe it as "sometimes spiny, the leaves entire or coarsely toothed", while Preston (1969) refers to it as "sometimes spiny, the leaves entire or sometimes lobed". Brandis (1921) speaks of "frequently spinescent branchlets". The illustration given by Raciborski (1900) shows no true thorns, but does show the spinescent twigs. Nairne (1894) asserts that *G. asiatica* is "less thorny than *G. elliptica*". Conspicuously spinose collections cited below include Bernardi 14357, Gould & Cooray 13666, Liang 79141, Moldenke & al. 28175 & 28226, Sumithraarachchi & Jayasuriya DBS.235, and Townsend 73/41.

The situation in regard to entire or lobed leaves is somewhat similar. Woodrow (1910) describes "entire or three-lobed opposite leaves"; Poirret's (1819) illustration depicts a flowering branch with some of the leaves entire and some slightly 3-lobed. On the other hand, Sastri's (1956) figure shows only entire leaves. Brandis (1907) speaks of the leaves as "frequently lobed". Srivastava (1976) refers to the branches as often spinescent and the leaves sometimes more or less obscurely lobulate. Nairne (1894) states that in *G. asiatica* the leaves are "scalloped and shiny", as compared to *G. elliptica* where they are "nearly entire and somewhat hairy". Varma (1981) refers to the leaves of *G. asiatica* as "irregularly and more or less obscurely lobulate".

It is worth noting here that the König 197 collection, cited below, consists only of fruit. Junell (1934) describes the gynoecium morphology of the genus, based on cultivated material of *G. asiatica* from Kew and Kajewski 1466, representing *G. dalrympleana* (F. Muell.) H. J. Lam: "Die Ausbauchungen von den mittleren Partien der Fruchtblätter verwachsen hier wie bei *Tectona* schon im obersten Teil des Fruchtknotens mit den ihrerseits verwachsenen Plazenten. An Längsschnitten.....sieht man einen Zipfel wie ein Dach über jede Samenanlage vorragen. Dieser Zipfel wird jedoch nicht von den Fruchtblatträndern gebildet. An Querschnitten von Fruchtknoten sieht man nämlich, dass dieser Zipfel innerhalb der Fruchtblattränder liegt. Was man in Fig. 141a in dem oberen rechten Fruchtknotenfach innerhalb des Fruchtblattrandes sieht, ist nämlich keine Samenanlage, sondern dieses Zipfelgebilde. Im Schnitt dagegen kann man die Samenanlage sehen. Auch in dem oberen linken Fruchtknoten fach ist dieses Zipfelgebilde zu sehen. In den beiden unteren, in etwas tieferem Niveau geschnittenen Fruchtknotenfächern sieht man die Samenanlage, den Fruchtblattrand un den basalen Teil dieses Zipfel. Es ist kein leitendes Gewebe ausgebildet. Dies kann möglicherweise darauf zurückgeführt werden, dass die untersuchten Fruchtknoten sehr jung waren. Obwohl die abgebildeten Querschnitte von dem Teil des Fruchtknotens stammen, der oberhalb der Samenanlagenbefestigungen liegt, sieht man in der Mitte der Querschnitte ein kräftiges Gefäßsbündel. An Längsschnitten von jungen Samenanlagen von *G. asiatica* habe ich gesehen, dass eine Tapetumschicht ausgebildet wird. Der Nuzellus ist im Verhältnis zur Samen-

anlage sehr unbedeutend und liegt tief in derselben versenkt."

It should be mentioned here, also, that *Lea & Worthington 7103* exhibits unusually large leaves, while *Fosberg & al. 50967* has very tiny leaves and is described as coming from a prostrate-growing plant (it doubtless represents the f. *parvifolia* (Roxb.) Mold. referred to above. *Ripley 378* is said to have had "one variegated twig". *Cooray 68102203R & 70031809R*, *Mueller-Dombois & Cooray 67072545 & 67121090*, and *Wirawan & al. 899* were collected as vouchers for ecologic studies, while *Ripley 111 & 378* are vouchers for primate ecologic studies with the notation that "monkeys feed on these leaves". A single flower mounted on the United States National Herbarium specimen of *Comanor 592* is of *Bauhinia racemosa*. *Fennell 1003* represents material taken from a cultivated plant grown from seed of *Fairchild & Dorsett 2969* from Guyana. Pollen has been taken from *Comanor 592* (hopefully not from the *Bauhinia* contamination) for study.

Fennell claims that *Gmelina asiatica* "can be grown as a standard, 1 m. tall".

Murray (1784) cites the *Jambosa sylvestris* of Rumpf (1741) and also provides a description in which he adds that the leaves are sometimes 3-lobed. It is most probable that he added this phrase to cover the Rumpf plate which illustrates the typically 3-lobed leaves of *Gmelina asiatica* f. *lobata*. I regard the specimen in Linnaeus' herbarium as the type (holotype) of the species in its typical form. Linnaeus (1753) cites as synonyms "*Michelia spinosa*, *floribus luteis* Amm. act. petrop. 8. p. 218. t. 18" and "*Lycium maderaspatanum indicum*, *alpino putati aemulum*, *foliis minoribus & majoribus bifugis*, & *grandioribus aculeis horridis*. Pluk. alm. 234. t. 303. f. 3 & t. 97. f. 2" with no description except "Habitat in India". Obviously both these pre-Linnean names refer to spinose plants and there is no mention or other indication of lobed leaves. It should be pointed out, however, that the pl. 303, fig. 3, in Plukenet's work, referred to by Linnaeus (above), actually depicts *Gardenia dumetorum*.

Raciborski (1900) maintains a *Gmelina parviflora* (probably a lapsus for "*parvifolia*"), of which he says: "Bei *Gmelina parviflora* sind als abwechselnd die transversal stehenden Achselknospen in ihrer Entwicklung bevorzugt, die darauf folgenden vertical stehenden retardiert. Bei anderen *Gmelina*-Arten [*G. asiatica*, *G. philippensis*] ist nur wenig von dieser Regelmässigkeit zu sehen."

The Baileys (1976) regard *G. elliptica* J. E. Sm. as a synonym of *G. asiatica* L. I maintain them as distinct taxa, but admittedly they are very closely related.

Merrill (1921) comments that "The Coromandel form [*G. coromandelica* Burm. f.] is doubtless identical with the Linnean species, but the reference to Sloane probably represents an entirely different plant; I have not seen Sloane's figure."

In this connection the descriptions given by Smith (1810) are most relevant: "1. *G. asiatica*. Linn. Sp. Pl. 873. Burm. Ind. 132. (*Jambusa sylvestris parvifolia*; Rumph. Amb. v. 1. 129. t. 40) -- Leaves roundish, somewhat three-lobed, acute, downy beneath.-- Na-

tive of Java, Amboina, and other parts of the East Indies. A tree, with straight, roundish, slightly downy branches. Leaves opposite, scarcely two inches long, of a roundish or elliptical form, acute, most generally furnished with a short broad lobe at each side, entire, smooth above; pale and downy beneath; the midrib sending off two principal lateral ones, a little above its base, and several smaller ones higher up, all which are branched. Footstalks downy, various in length, often nearly equal to the leaf, each with a small hairy bud above its insertion, and above that usually a straight, downy, horizontal spine. Flowers in a short, simple, downy, terminal racemus. Calyx downy, besprinkled with several large, shield-like, smooth glands. Corolla large, yellow. Rumphius's figure unquestionably belongs to this plant, but his description seems that of an *Eugenia*. Plukenet's t. 305. f. 3. is certainly *Gardenia dumentorum* and resembles our *Gmelina* only in being thorny: his t. 97. f. 2. may possibly be intended for *Gmelina parvifolia*, but is of no use as to determining it."

"3. *G. parvifolia*. Roxb. Corom. v. 2. 31. t. 162. (*G. coromandlica*; Burm. Ind. 132) -- Leaves obovate, undivided or three-lobed, smooth on both sides. -- Common in every forest and uncultivated place on the coast of Coromandel, flowering in October and November. Roxburgh. It is often intermixed with *G. asiatica*, from which it differs in its more humble size, larger and constant thorns, and especially in its smaller leaves, which are smooth on both sides. Their flowers and fruits are alike, the latter being yellow, obovate, the size of a small cherry. We perceive on one calyx in our specimen a solitary gland, like those described in the two former. -- Dr. Roxburgh mentions that cold water, stirred with a leafy branch of this shrub, becomes thick, from the abundant mucilage of the leaves, and is used in that state as a remedy for the heat of urine which accompanies gonorrhoea. Water stirred with branches and leaves of *Petalium Murex* becomes in like manner mucilaginous, and is used for the same purpose, but soon loses its consistency, which is not the case with such as is prepared with this *Gmelina*. The Telingas call the plant *Shieri goomoodoo*. It may possibly be Plukenet's *Lycium Maderaspatanum*, t. 97. f. 2, as Burmann takes it to be, but Sloane's *Rhamnus*, Hist. of Jamaica, v. 2. t. 207, f. 1, cannot be the same, though his vile figure affords no distinct indication of what he means."

It should be noted that the *Jambosa sylvestris* of Rumpf, referred to above, is now regarded as applying to *G. elliptica* J. E. Sm.

Ainslie (1826) asserts that *Gmelina asiatica* "was first scientifically described by Professor Gmelin of Petersburg", but as yet I have not been able to verify this claim -- as far as I know, Gmelin never saw or wrote about this species before Linnaeus. Ainslie goes on to say: "I shall conclude what I have to say of this plant by a remark from Miller; *viz.*, that the *cumbula* of the Hort. Mal. (i. t. 75. t. 41) is by no means a *bignonia* (*catalpa*), but a genuine species of *Gmelina*, as the fruit evinces."

Walpers (1945) describes *G. parvifolia* Roth as "*Fruticosa spinosa: spinis foliiferis; foliis sessilibus cuneatis et obovato-cuneatis,*

integerrimis vel apice emarginatis vel (ramorum steriliis) majoribus apice grosse tridentatis; racemis terminalibus paucifloris..... Proxima *Gm. Asiatica*, sed differt foliis multo minoribus semipollicaribus pollicaribusve, 2--5 lin. latis, spinis numerosioribus numquam deficientibus racemisque semper terminalibus..... Crescit vulgaris in omni ora Coromandeliana." *G. asiatica*, he says, "Crescit in tota fere India orientali". He saw herbarium specimens of the latter, but apparently nothing of the former.

Dietrich (1843) accredits *G. asiatica* to "Ind. or.", but *G. parvifolia* Roxb. to "Java", describing it as "fol. ovatis tricuspidatis simplicibusve subtus glaucescentibus et glanduloso-punctatis et in venis ramulisque puberulis."

It is of interest, also, to note that the name, *G. parvifolia* is accepted and used by Smith (1810, 1820), Voigt (1845), Schauer (1847), Buek (1858), and Naves (1880) for a distinct taxon of specific rank, while *G. parviflora* is used for it by Blume (1826), Ainslie (1826), Sweet (1826, 1832), Loudon (1830, 1832), Dietrich (1837), Don (1839), Walpers (1845), Schnitzlein (1856), Fernandez-Villar (1880), Koorders & Valetton (1900), Raciborski (1900), and Burck (1890). Schauer (1847) says for what he calls *G. parvifolia* Roxb.: "Aff. *G. asiaticae*, sed foliorum figura [subrhombaeobovatis obtusis emarginatisve postice cuneatis integerrimis vel 3--5-lobis triangularibus obtusiusculis glabratis supra nitidulis subtus glaucis], tomentoque paniculae [farinaceo-tomentosis] corollaeque [extus puberula] uberrime diversa." For *G. asiatica* he says: "foliis ovalibus vel subrhombaeobovatis triangulari-acutis integerrimis vel utrinque lobo laterali novellis subtus tomentellis..... adultis glabratis supra nitidis subtus glaucis..... racemis..... pube appressa tomentosis..... Corolla extus rufo-pubescentis." He bases his description of the former on a specimen in the DeCandolle herbarium and of the latter on both live material and a herbarium specimen in the same herbarium.

Gmelina asiatica is said by Raeuschel (1797) to be native only to "India"; Cooke (1905) gives its natural distribution as western peninsular India, Burma, and Sri Lanka; Preston (1969) gives it as only India and Sri Lanka. For his *G. coromandelica* Burman gives the distribution as "Habitat in India ultraque."

For *G. asiatica* Chun (1940) gives the natural distribution, as accepted by him, as India, Thailand, Indochina, Malay Archipelago, the Philippines, and south China (Kwangsi) -- of this, however, the Philippine portion is incorrect (being a misidentification of *G. elliptica*). Ramamurthy (1963) lists it for Madras and Inamdar (1971) found it in Gujarat. Ellis (1966) records it from Andhra Pradesh, citing his no. 14276, while Sebastine & Ellis (1967) list it from Madras, citing Sebastine 10625. Rao and his associates (1963) found it growing on Rameswar Island. Martin (1971) lists it for Cambodia, Laos, Vietnam, Thailand, Malaysia, India, and Indonesia. Naithani (1966) reports it "common" in Mysore, citing his no. 23250; Pételot (1953) describes it as common throughout Indochina. Thwaites & Hooker (1861) report it as "very common in open places in low country up to 2000 ft." in Sri Lanka, citing C.P. 1952. Sebastine & Ramamurthy (1966) report it common in Madras, citing their no. 14669; Gausse and his associates (1964) also list it from

Madras. Puri (1960) tells us that it was killed or very seriously damaged by the abnormal frosts in Dehra Dun in January and February, 1905, but in other years it was only "slightly affected" there.

Sastri (1956) asserts that *G. asiatica* is native to the Deccan Peninsula of India and is also planted there; Srivastava (1976) reports it frequently planted in gardens in Gorak for its ornamental flowers, citing his no. 148. Prain (1903) describes the plant as "Generally cultivated" in Bengal. Patel (1971) found it in cultivation in Gujarat; Sen & Naskar (1965) also report it cultivated in India, as does Singh (1969), the latter citing his no. 31993. Corner (1952) describes the species as "occasional" or "rather scarce" in gardens and villages in Malaya, "certainly not wild". Roig (1953) reports it cultivated in Cuba, Molina (1975) in Honduras, and Van Rensselaer (1948) in California. The Baileys (1976), giving only India and Sri Lanka as its native home, claim it to be hardy in the United States in their growth zone 10. Sweet (1826, 1830, 1839) and Loudon (1830, 1832) claim that what they call *G. asiatica* was introduced into cultivation in England in 1792 from the "E. Indies" and what they call *G. parviflora* in 1817 also from the "E. Indies" -- this seems most unlikely; probably eastern India (Ind. or.) was intended rather than "E. Indies" (East Indies or Indonesia).

Brandis (1907) calls *G. asiatica* "A common bush on the Coromandel coast, south as far as Tutucorin, also inland in the Deccan and Karnatik....Ceylon." In his 1874 work he says "South India, Ceylon, and Indian Archipelago. Probably in the Central Provinces" and avers that it flowers "nearly throughout the year". Cooke (1905) says of it: "Doubtfully wild in the Bombay Presidency, where it is however extensively grown in gardens and employed for making fences. It is abundant on the Coromandel coast.....It is also common in Ceylon and is cultivated in Bengal." Gupta & Marlange (1961) report it "Probably indigenous in Circars, Deccan, Carnatic and the low country of Ceylon up to 600 m. Planted [in Pondichery] for its beautiful bright yellow flowers." Marlange and his associates (1965) report that it grows "with *Memecylon umbellatum* as dominants in dry evergreen forests on red ferrallitic soils in Pondichery."

Burkill (1966) describes *Gmelina asiatica* as "A thorny shrub of the moister parts of India, wild in the south and cultivated in the north; it is apparently an introduced plant in the Malay Peninsula, where it occurs in the more settled parts. Ridley, in arguing that it is introduced, states that it seems not to flower in the southern part of the Peninsula, but this is not [always] the case, as it flowers freely in Singapore."

Gamble (1902) also lists it as native to South India, the Circars, the Deccan Peninsula, and Carnatic, as well as in the low country of Sri Lanka to 2000 feet elevation, adding "elsewhere planted" and citing his no. C.4336. P'ei (1932) cites only Morse 166 from Kwangtung, China, giving the species' overall distribution, as accepted by him, as "British-India, Burma, Siam, Cochin-China, Philippines [erroneous!], Malay Archipelago" and comments that "This is allied to *Gmelina arborea* Roxb. which has much larger leaves and also smaller calyx glands. The leaves in *G. asiatica* L. are more densely yel-

lowish-pubescent rather than bluish-green glandular beneath. The Chinese form has smaller leaves than those of tropical Asia." It would appear that P'ei has confused the two species in this statement, with their characters reversed.

Roxburgh (1814) cites an unnumbered collection presented to him by Dr. Berry in 1799 from Coromandel. Trimen (1895) gives the natural distribution of the species as only Sri Lanka and "South India", flowering there in September. Talbot (1909) gives the self-same distribution, adding that it is only "Doubtfully wild in the Bombay presidency", but is commonly planted in gardens near Bombay, where it "makes an excellent hedge plant" and blossoms throughout the year.

Hallier (1918) cites *Kamphövener* 652 from India, *König* 197 from Sri Lanka, *Buitendijk* s.n. from Sumatra, and *Korthals* s.n. from Borneo. He adds: "Mauritius (kultiviert?), Vorderindien! Nach Gamble in Perak, auf Singapore und Java. Nach Rumphius auf Celebes, nach L. S. Gibbs in Indochina and N. O.-Borneo." Prain (1963) assures us that in Bengal it occurs only in cultivation.

Lam (1919) mistakenly reduces *G. bracteata* Burck, *G. finlaysoniana* Wall., *G. hystrix* Schult., and *G. philippinensis* Cham. to synonymy under *G. asiatica*. Actually all these names belong in the synonymy of *G. philippensis* Cham. He cites Hallier C.124 (as *G. bracteata*) from Banka, *Korthals*, Herb. Lugd.-Bat. 908.266-880 from Borneo, and Elmer 8934, Lilles 13, and Ramos 338 from Luzon -- these probably all actually being *G. philippensis*. In his excessively broad concept of the species, he gives its overall distribution as Mauritius, the Deccan Peninsula, Ceylon, Bengal, Siam, Philippines, Borneo, Banka, Sumatra, Java, and the Malay Peninsula, but adds "often (always?) cultivated. The species has an affinity with *G. villosa* with which it is confounded, but differs very distinctly from it, among other things by its glabrous leaves."

Dop (1935) cites unnumbered collections of Evrard, Hayata, and Poilane from Annam, of Baudouin, Germain, Geoffray, and Pierre from Cambodia, Balansa and Bon from Tonkin, d'Orléans from Laos, Harmand, Lanessan, Lefèvre, and Thorel from Cochinchina, and of Schomburgk from Thailand. He notes: "souvent cultivé".

Clarke (1885) reports *G. asiatica* "frequent" in the Deccan peninsula and Sri Lanka and cultivated in Bengal, citing only an unnumbered Roth collection. Collett & Hemsley (1890) add Burma to its known distribution, not specifying if wild or cultivated there. Voigt (1845) lists both *G. asiatica* and *G. parvifolia* as cultivated in the suburbs of Calcutta, the former blooming there throughout the year, the latter only in April.

Subramanian & Kalyani (1977) tell us that *G. asiatica* grows in the Southern Tropical Thorn Forest ecologic association along with such other species as *Solanum pubescens*, *Barleria cuspidata*, *Grewia villosa*, *Cipadessa baccifera*, *Rhus mysorensis*, *Atlantia monophylla*, *Tarenna asiatica*, *Dichrostachys cinerea*, and *Phyllanthus polyphylla*. Jayasuriya (1980) reports it "common, chiefly in dry and intermediate lowlands" in Sri Lanka, citing Worthington 5172.

Varma (1981) states that *G. asiatica* is "frequently planted as [an] ornamental shrub in gardens. The plant fails to bear fruits in

the [Bhagalpur] district" of India, but flowers there from April to September. He cites only *Varma 1479*. Vajravelu & Balakrishnan (1967) assert that it is common in Madras, citing their *no. 20591*, in both flower and fruit in July. Panigrahi & Seran (1968) found it growing "along a small nala near the roadside, probably planted" in Rajapur, citing their *no. 11288*. Sharma and his associates (1975) report it only "occasional" at 950 m. altitude in Tamil Nadu, citing *Sharma 39867*. Sprangers & Balasubramanian (1978) collected it in dry tropical semi-evergreen forests, also in southeastern India.

Kurz (1877) reports the species "Not unfrequent (sic) along choungs in the swamp forest of the Sittang valley (Burma) and near Rangoon", flowering in May. He also encountered it in the evergreen forests of Pegu. Merrill (1921) cites only *Hallier 184* and *Korthals & n. from Borneo* and *Gibbs 2719 from Sabah*, giving the species' overall distribution, in his opinion, as "India to the Malay Peninsula and Java".

Haines (1922) states than in Bihar/Orissa it occurs "Wild or probably escaped on the sandstones near Rairakhol, not far from the town! Often grown in gardens," flowering there from April to June. He notes further that the "Leaves in the Bairakhol plant [are] somewhat fleshy. Calyx and corolla with small glistening glands as well as somewhat pubescent." Kirtikar & Basu (1918) list it from the North Circars, East Deccan, Carnatic, and Sri Lanka, adding that it is "Planted in the Bombay Presidency and Bengal, Burma". Ridley (1923) lists it from Malacca, Singapore, Negri Sembilan, Perak, and Trengganu, but hastens to comment that "I have great doubts as to this being a native here [Malaya]. It occurs sporadically as a shrub, and I have never seen any trace of flowers or fruit, at least south of Tringganu", where he avers that it grows along the seashore. He cites only an unnumbered Scortechini collection from Perak.

In Sri Lanka recent collectors refer to *Gmelina asiatica* as common (Cooray), at least in open forests with trees up to 15 m. tall, on forest edges, and in open tall scrub with scattered clumps of trees and grass between the clumps, very common in the shrub ectone between forests and tanks, growing in light-colored soil. Fosberg & Sachet report it "occasional at the edge of thickets and among tall grass on coarse gritty soil". Other collectors refer to it as only occasional in dense scrub forests and rare in the open belt adjacent to forest margins dominated by low suffrutescent herbs growing in sand. They have encountered it in dryland forests, in dry forests around tank margins, on the brushy coastal hills, in clay sand at shrub borders, in thickets surrounding rock outcrops, on the edges of tank bunds, at the edges of jungles, in soil pockets on gneissitic granite outcrops, in exposed sandy soil, in hedges with various euphorbs, and in moist sand near freshwater ponds among vegetation characterized by the presence of *Calamus*. It is sometimes frequent just above the normal water level of lagoons.

Fletcher (1938) cites from Thailand only *Kerr 7005, 19974, & 21527, Lakshnakara 859, and Put 2552*, giving the overall distribution, as accepted by him, as India (type), Burma, Indochina, and Malaya.

It should be noted here that *Gmelina inermis* Wight is based on Wallich 1816d from Malaya. Wallich (1831) cites for what he regarded as *G. parvifolia* Roxb. his nos. 2654 & 2654E and as a questionably synonymous *G. asiatica* his nos. 2654B, 2654C, & 2654D. His no. 2654E he cites as "*Gm. parvifolia* Hb. Ham. e Mirgapur" and his no. 2654B as "*Gm. asiatica* Hb. Russel", 2654C as "*Gm. asiatica* Hb. Madr.", and no. 2654D as "*Gm. asiatica* Hb. Heyn." In his 1829 work he cites no. 1818 as "*G. asiatica* L." from (1) "Hb. Heyne" and (2) "Hb. Bot. Calcutt."

The original description of *Premna parvifolia* Roth (ex Dietrich, 1843) is: "fol. ovato-subrotundis integerrimis tridentatisve glabris; racemo terminali. In Ind. or. \mathfrak{h} Caulis lignosus fruticosus. Flores pedunculati oppositi magni." The original description of *Gmelina parvifolia* Roxb. (ex Dietrich, 1843) is "fol. ovatis tricuspidatis simplicibusve subtus glaucescentibus et glanduloso-punctatis et in venis ramulisque puberulis. In Java. \mathfrak{h} " The same author gives the original description of *Gmelina asiatica* L. as "spinosa; fol. ovatis tridentatis subtus venosis tomentosis; racemis terminalibus. In Ind. or. \mathfrak{h} " The tomentose leaf character seems to apply, rather, to *G. elliptica* J. E. Sm.

Because of the obviously many misintrepretation in past literature, it seems worthwhile to quote Roxburgh's (1832) descriptions and discussions of what he regarded as *G. asiatica* and *G. parviflora*.

"4. *G. asiatica*. Willd. iii. p. 313. Shrubby, spinous. Leaves sub-opposite, oval, and somewhat lobed, smooth. Racemes terminal, and from the forks of the branchlets. Bractes small, caducous. Fruit oval. *Jambosa silvestris parvifolia*. Rumph. Amb. i. p. 129. t. 40. Teling. Goomoodoo. Is one of the most common bushes in every uncultivated place over the coast of Coromandel, and in flower and fruit all the year round. Trunk, I cannot say it has any thing like a distinct one, as I have always found it in the state of a large, ramous shrub. Branches numerous, very irregular. Thorns axillary, opposite, horizontal, leaf-bearing. Leaves on the young shoots generally opposite, on the woody branchlets fascicled, petioled, broad oval, or obcordate, irregularly lobed, both sides smooth and shining, from one to an inch and a half long, and about one broad. Racemes from the divisions of the branches, or terminal. Flowers large, yellow, opposite, approximate, drooping. Bractes lanceolate, small, concave, caducous. Corol the upper lip largest. Anthers, all four are two-parted. Stigma two-parted, the lower four times longer and revolute. Nut four-celled, generally two or three of them abortive. The only use this shrub is applied to, is for fences and fuel.

"5. *G. parviflora*. Corom. pl. 2. N. 162. Shrubby, spinous. Leaves obovate, from entire to three-lobed. Racemes terminal. Teling. Shieri-goomoodoo. *Arbuscula Bisnagarica*. Pluk. Alm. tab. 14. f. 4. *Gmelina coromandelica*. Burm. Flor. In. p. 32. Is common in forests, and uncultivated places all over the coast. Flowering time October and November. It differs from *asiatica* in the following respects. 1st. This is always a smaller plant, with much smaller leaves, although growing together on one spot, which is common. 2nd. The thorns

are more numerous, and always present. 3rd. The racemes are terminal. 4th. The leaves have the quality of thickening water like those of *Pedaliium murex* and *Menispermum hirsutum*. The flowers and fruit are in both the same. The natives employ the water impregnated with the gelatinous quality of the leaves as a ptisan for the cure of the heat of urine in gonorrhoea. Water is also rendered glutinous by the leaves of *P. murex*, by only turning them round in it, but the water soon returns to its original state. The leaves of this plant, *G. parvifolia*, must be gently bruised with the hand in the water and it remains mucilaginous till decomposed by fermentation."

The original description of *Gmelina integrifolia* Hunter is: "*Gmelina integrifolia*, H. (*G. asiatica* L.). Leaves most entire; Raceme simple terminal. Stem: a large shrub, very branchy, with spines awl-shaped, acute, horizontal. Branches spreading, flexile, with spines, opposite decussated. Leaves opposite, decussated, petioled, ovate, obtuse, most entire; above roughish, deep green, below downy. Petioles half the length of the leaves, slender, downy. Racemes simple, terminal, few flowered. Flowers large, yellow; structure as in the generic character. Drupe roundish, smooth, of a greenish yellow. Nut obovate, smooth three celled: one cell barren. Kernels in the fertile cells solitary, obovate, without convex, within flat. This shrub, which approaches in size to a small tree, is very common in hedges, by the road side. The fruit contains a juice of a disagreeable smell, and gives a very permanent stain, of a yellowish brown colour." This binomial, although apparently proposed as a substitution for Linnaeus' *G. asiatica*, seems definitely to apply, instead, in its description to *G. elliptica* J. E. Sm.

Vernacular and common names recorded for *Gmelina asiatica* are very numerous and include the following: adivi gumadi, álamo blanco, an chanh, Asiatic beechberry, Asiatic gmelina, badhára, bagaboboi, baghara, bhadra, bhdara, bhedaira, biddari, biddarie, bulang, bulangan, bulongan, challa-gumudu, cherkumizhi, chirugummudu, coumelon, daem rumcaiji, demata, demette ette, gaeta-demata, gamudu, gáng, gáng tu hú, gatta-demmata, gatta demmatta, gmelin asiatique, gmelina asiatique, gmelina olie, gmeline de Asia, goomoodoo, gopabhadra, gopogombhari, guludu, gumadi, gumhar, gummadi, gumudu, heilpeeren, ivy-leaved bulang, jobo de Asia, kadambal, kajoe mereh, kálishivan, kalshivani, kal-shivani, karu gummadi, kavva-gumudu, kevva-gumudu, kumil, kumizhaniaran, lahan shivan, láhán shivan, latkesar, nagphul, nag-phul, neelacomul, neelacoomul-vayr, nelacoomul root, nélâcoomul vayr, nelacoomul vayr, nela goomadie, néla goomâdie, nélâ goomâdi vayroo, nela-gumada, nela-kumi, nilacúmal, nilakkumil, nilak-kumazh, nilak-kumizh, nila-kum, nondano, ostindische Gmeline, oval-leaved gmelina, root of the Asiatic gmelina, shieri-goomoodoo, shieri-gumudu, small-flowered gmelina, vikarini, waren, and wareng.

The roots of *G. asiatica* are aromatic and mucilaginous and are or have been employed in local medicine in India as a demulcent, alterative, and slightly bitter astringent, employed in the treatment of gonorrhea, catarrh of the bladder, and rheumatism, and as a blood purifier. In former times the roots were dug only on St. Mary's

Day and then only those that were naturally oriented toward the north could be used. In Goa the root was once used in the treatment of practically every disease and ailment. Ainslie (1813) affirms that "This root, which is mucilaginous and demulcent, the Vytians reckon amongst those medicines which purify and sweeten the blood in cases of depraved habit of body; given in the form of electuary, to the quantity of a tea-spoonful." The young shoots and leaves also are mucilaginous. When bruised they will thicken cold water and this is said to show antibiotic activity against *Escherichia coli* and *Staphylococcus aureus*. The bark is used to aid the fermentation of toddy. The stems are sometimes used for making axe-handles. The wood is used for making fences, churning-sticks, and fuel. The fruit is edible, but not much appreciated. The seeds yield 7.5% of a greenish-yellow, semi-drying, fatty oil which contains palmitic, stearic, arachidic, linoleic, oleic, and ricinoleic acids (Gibbs, 1974). The unsaponifiable water, according to Aggarwal & Soni (1949), contains a sitosterol.

In Cambodia an infusion made from *Gmelina asiatica* is prescribed in the treatment of yaws. A glucosidic substance is reported to be present, but no saponins (Wehmer, 1931). According to Brandis (1907) the plant is useful for hedges. Watt (1889) also reports its use as a laxative and in the treatment of syphilis, but the uses ascribed to the "rais Madre de Deos" of the Portuguese, to Loureiro's "Flora of Cochin China", and to Rumpf's "*Jambusa sylvestris parviflora*" do not apply to the present plant, but apply most probably, instead, to *G. elliptica* J. E. Sm.

Bose (1965) affirms that *G. asiatica* "is amenable to gootie preparation". Kirtikar & Basu (1935) state that "The root is aphrodisiac and expectorant; useful in the treatment of pains in the joints (Yunani)". According to Mueller-Dombois & Comanor the plant is "eaten by elephants" in Sri Lanka.

Crevost & Petelot (1934) say: "Arbust dont les feuilles ressemblent à celles du lierre; les jeunes rameaux renferment un mucilage épais, visqueux, employé pour combattre les ardeurs de la blennorrhagie; l'eau ainsi rendue mucilagineuse ne se décompose pas comme celle que l'on prépare avec le *Pedaliium murex*."

Petelot (1953) affirms that "Au Cambodge.....la plante entière est ordonnée en infusion contre le Pian (2 poignées dans un litre d'eau environ) et la racine fait partie du traitement de l'incontinence d'urine; on associe alors aux écorces d'*Hopea odorata* et d'*Hydnocarpus anthelmintica*. Les feuilles et les jeunes rameaux renferment en grande quantité un mucilage visqueux qu'ils cèdent à l'eau froide et dans l'Indie, la macération est utilisée comme émoulliente dans la blennorrhagie pour calmer les douleurs de la miction. La racine est tenue en très haute estime par les Portugais qui la regardent altérante et émoulliente."

Gmelina asiatica is parasitized by the mistletoe, *Dendrophthoe falcata* (L. f.) Ettingsh., according to Singh (1962).

Burck (1891) informs us that "Nicht weniger interessant ist das Geschlecht *Gmelina* in Hinsicht des Schutzes, welchen desselbe durch die Ameisen genießt. Bei den drei Arten hiervon, die ich zu unter-

suchen Gelegenheit hatte - *Gmelina asiatica* Linn., *Gmelina parviflora* Roxb., sowie eine Art von Banka, die ich *bracteata* benannt habe [= *G. philippensis* Cham.], aus Gründen, die sofort deutlich werden sollen -- finden sich wieder ausschliesslich Nectarien auf den Kelch, aber sie nehmen da einen eigenthümlichen Platz ein. Fanden wir bei den bereits besprochenen Pflanzen [*Ipomoea*, *Faradaya*, *Nyctocalos*, *Fagraea*] die Nectarien stets auf der ganzen Oberfläche des Kelches zerstreut, so treffen wir sie hier ausschliesslich auf der oberen Seite an. Die Blüthen von *Ipomoea*, *Nyctocalos*, *Fagraea* u.s.w. sind von allen Seiten frei, und es bespricht so zu sagen kein einziger Grund, warum eine *Xylocopa* die Blumenkronenröhre allein von der Seite aus anfallen sollte. Bei *Gmelina* ist dies anders. Die Blüthen dieser Gattung sind in traubenförmigen Rispen angeordnet, welche aus dreiblüthigen, sehr kurz gestielt und von einer Bractee gestützten Trugdolden aufgebaut sind. Diese Stellung der Blüthe macht es nun, dass die selbe auf der einen Seite gegen das Anbohren der Bienen durch die Axe der Inflorescenz geschützt ist, sodass allein an der frien oberen Seite Gefahr besteht. Ich halte es für keine zufällige Coincidenz, dass der Kelch allein an der letztgenannten Seite 5--6 grosse Nectarien trägt, und das solche auf der gegenüberliegende Seite niemals gefunden wurden.....Die Liebwache von Ameisen wird daher hier in unmittelbarer Nähe der bedrohten Stelle zusammengehalten. Es werden jedoch immer noch bei *Gm. asiatica* \pm 20 procent und bei *Gm. parviflora* \pm 40 procent der Blumen angebohrt."

Numerous errors occur in the literature of *Gmelina asiatica*. For instance, Fernandez-Villar (1880) lists *G. asiatica* from Luzon ("Vulgaris ad Manilam"), Mindanao, and Panay in the Philippine Islands and *G. parvifolia* from Luzon and Panay, with the vernacular name for both recorded as "talunġun". He cites "*G. inermis*, Naves (non Blanco" as a synonym of the latter. The plant to which he is referring here is *G. philippensis* Cham.

The plate 5, figure 3, of Plukenet, *Almagest. Phyt.* (1700), often cited as illustrative of *Gmelina asiatica*, actually depicts *Gardenia dumetorum* in the Rubiaceae. Stickman (1754), Linnaeus (1759), and Hallier (1918) cite *Radix deiparae* Rumpf as a synonym of *Gmelina asiatica*, but it actually belongs in the synonymy of *G. elliptica* J. E. Sm. The "*G. asiatica* L." of Blume (1826) is certainly *G. elliptica*, but his *G. parviflora* Roxb. probably actually is *G. asiatica*.

Chun (1940) cites Liang 79141 as the first record of *G. asiatica* from Kwangtung province, noting that the so-called Kwangtung locality recorded by P'ei (1932) as the first record is an error, since the collection P'ei cites was actually made at Lunchow, which is located in Kwangsi province.

The Dop (1915) reference in the bibliography (above) is often cited as "1914", the titlepage date. Stapf (1930) erroneously cites the Poirer (1819) reference as "1797" and the Roxburgh (1802) reference as "1798".

The genus *Gmelina* is said to be referred to in Biol. Abstr. 29: 3291 and 30: 3983, but I fail to find any such reference on the pages indicated.

Sebastine (1959) cites his no. 634 and Ramaswamy (1967) his nos.

2404, 2409, & 1597 from India.

Several authors have provided partial keys through which to differentiate *G. asiatica* from certain other species of the genus as interpreted by them. These keys may be worth reproducing here.

BAKHUIZEN (1921):

1. Inflorescence axillary, 1--few-flowered; calyx 1.5--2.5 cm. long, with large deltoid segments, densely villous within... *G. uniflora*.
- 1a. Inflorescence terminal, paniculate, many-flowered; calyx 0.5--1 cm. long, short-toothed to subtruncate, glabrous or with some hairs within.
2. Ovary densely hairy, especially toward the top; flowers with a shade of purple in the center, sometimes bright yellow or bright blue.
3. Leaves more or less densely pubescent beneath; calyx 0.5--1 cm. long, with some long hairs within..... *G. moluccana*.
- 3a. Leaves glabrous beneath or scarcely pubescent on the veins only; calyx 3--5 mm. long, glabrous within... *G. dalrympleana*.
- 2a. Ovary glabrous or nearly so; flowers yellow.
4. Trees; inflorescence terminal, erect; leaves large.
5. Calyx glabrous; filaments distinctly hairy... *G. palawensis*.
- 5a. Calyx densely pubescent; filaments glabrous or with some glanduliferous hairs.
- *6. Leaves oblong or subobovate, basally truncate or sub-cuneate, apically short-acuminate, glabrous or somewhat pubescent on the veins beneath..... *G. arborea*.
- *6a. Leaves broadly ovate, basally cordate, apically abruptly acuminate, densely hairy beneath..... *G. asiatica*.
- 4a. Climbing shrubs; inflorescence subpendulous; leaves small.
7. Corolla large, 4-lobed, apically ventricose, 4--9 times as long as the calyx..... *G. asiatica*.
- 7a. Corolla small, 5-lobed, less than 4 times as long as the calyx..... *G. lepidota*.

P'EI (1932):

1. Calyx truncate or short-toothed, the teeth not over 1.5 mm. long.
2. Ovary densely pubescent; calyx truncate or with rudimentary teeth; leaves ovate-elliptic..... *G. chinensis*.
- 2a. Ovary glabrous or nearly so; calyx dentate; leaves broadly ovate.
3. Erect trees; leaves large, 10--25 x 5--18 cm.; inflorescence erect..... *G. arborea*.
- 3a. Scandent shrubs (at least when young); leaves small, not over 10 cm. long; inflorescence pendulous..... *G. asiatica*.
- 1a. Calyx distinctly lobed, the lobes to 11 mm. long.
4. Ovary densely pubescent; calyx with many large glands; leaves large, usually 7--15 x 5.5--7 cm.; inflorescence terminal, dense..... *G. hainanensis*.
- 4a. Ovary glabrous; calyx with usually only a few large glands; leaves small, not over 2.5 cm. long; inflorescence terminal, lax..... *G. delavayana*.

* It would appear that the lines numbered "6" and "6a" had the specific names accidentally transposed by Bakhuizen or his editor.

Other authors differentiate these two species as follows:

KURZ (1875):

Flowers 5-merous; corolla 2-lipped, the upper lip short, 2-lobed, straight.....*G. arborea*.

Flowers 4-merous; corolla-lobes 4, almost equal, the upper one reflexed.....*G. asiatica*.

COOKE (1905):

Unarmed tree; leaves exceeding 3 inches long, stellate-fulvous-tomentose beneath; calyx-teeth five.....*G. arborea*.

Often spinose shrub; leaves less than 2 inches long, glabrous and glanduliferous beneath; calyx-teeth four.....*G. asiatica*.

CORNER (1952):

Trees, not thorny; leaves over 3 inches long, with a long tip.....*G. arborea*.

Thorny bushes or small trees; leaves 3 inches long or less.

Leaves woolly-felted beneath; bracts green.....*G. elliptica*.

Leaves not woolly-felted beneath.

Bracts large, purplish, 1 to 3 3/4 inches long; leaves up to 3 inches long.....*G. philippensis*.

Bracts not as above; leaves up to 1 1/2 inches long, often 3-lobed.....*G. asiatica*.

MOLDENKE (1954):

Leaf-blades large, 18--23 cm. long, usually cordate or subcordate at the base, unlobed; branches unarmed.....*G. arborea*.

Leaf-blades small, 1--5 cm. long, usually acute or acuminate at the base, often 3-lobed; branches often spiny.....*G. asiatica*.

PRAIN (1963):

Unarmed tree; leaves large, ovate-cordate, acute, fulvous-tomentose beneath.....*G. arborea*.

Shrub, armed or not; leaves small, ovate or obovate, base not cordate, glabrous and glaucescent beneath when mature, with a close coating of minute glands.....*G. asiatica*.

SRIVASTAVA (1976):

Flowers yellow; leaves 2--5 cm. long.....*G. asiatica*.

Flowers yellowish-brown; leaves 10--23 cm. long.....*G. arborea*.

Material of *Gmelina asiatica* has been misidentified and distributed in some herbaria as *G. chinensis* L., *G. philippensis* Cham., *G. villosa* Roxb., *Premna pyramidata* Wall., and even *Bignoniaceae* sp. On the other hand, *Chin* 937, distributed as typical *G. asiatica*, actually is its f. *lobata* Mold., while *Herb. For. Dept. N. Borneo* SAN. 15304, *Saiekh* & *Aban* SAN. 82322, *Sheehan* R.33, *Siebold* s.n. [Java], and *Toroes* 5357 are *G. elliptica* J. E. Sm., *Wilkes* s.n. [Calderal] is *G. elliptica* f. *lobata* (Gaertn.) Mold., *Fairchild* 2969, *Merrill* 2932, *Peterson* J.2501, and *Surapat* 357 are *G. philippensis* Cham., *Sumithraarachchi* & *Jayasuriya* DBS.235 is a mixture with something non-verbenaceous, and *Winit* 414 is a mixture with *Premna pyramidata* Wall. (as cited by Fletcher) and *P. tomentosa* Willd. *Herb. Linnaeus* G.780/3 is the holotype of *Flacourtia indica* (Burm. f.) Merr., with alternate very long spines.

Citations: GUYANA: *Ramasamy* 31 (W--2221846). MASCARENE ISLANDS: Mauritius: *Commerson* 260 (P). REUNION: *Herb. Harvey* s.n.[1846] (Du--

166603); *Herb. Mus. Paris* s.n. (N, P). INDIA: Karnataka: Ramaswamy 2402 (Ld). Kerala: Meebold 12702 (S). Maharashtra: J. Fernandez 88 (Xa). Tamil Nadu: Wight 2321 (Mu--1367, Pd, S), s.n. (N); Veshoda 142 (B, N). Union Territory: Collector undetermined 638 (Br); Perrottet 422 (Mu--1177, V), s.n. [1835] (W--2496345). State undetermined: T. Anderson s.n. (Br); Roxburgh s.n. (Br, Br). SRI LANKA: Amaratunga 318 (Pd), 455 (Pd), 1357 (Pd), 1627 (Pd); Banda & Worthington 6893 (K); Bernardi 14357 (W--2766763), 15339 (W--2807857); Collector undetermined s.n. (Pd); Comanor 592 (Ac, N, W--2612092, W--2612093), 829 (Ac, N, Pd, W--2612091), 883 (Ac, N, Pd, W--2612097); Cooray 68102203R (Ld, N, Pd, W--2612096), 70031809R (E, N, Pd, W--2656657); Chamer 4096 (W--2803413), 4673 (W--2877232); Davidse 7406 (Ld, W--2806296); Fosberg 50237 (Pd, W--2612094, W--2744536); Fosberg & Balakrishnan 53542 (Tu, W--2724106); Fosberg, Mueller-Dombois, Wirawan, Cooray, & Balakrishnan 50933 (W--2633848), 50967 (W--2676613); Fosberg & Sachet 52959 (Ac), 53060 (Ld, W--2750159), 53158 (Kh); Gould & Cooray 13666 (W--2574832A); Hladik 821 (W--2761098); Jayasuriya 401 (Pd, W--2719875); Kirmll 226 (Mu--738); Kbnig 197 (Le); Lee & Worthington 7103 (K); Moldenke, Moldenke, & Jayasuriya 28226 (Ac, E, Gz, Pd, Tu, W--2764491); Mueller-Dombois & Comanor 67062513 (Pd); Mueller-Dombois & Cooray 67062307 (Pd, W--2586013A), 67072545 (Pd, W--2586012A), 67121090 (Pd, W--2612095); Ripley 111 (Pd, W--2717915), 378 (Pd, W--2717041); Sumithraarachchi & Jayasuriya DBS.235 in part (Ac); Sumithraarachchi & Sumithraarachchi DBS.764 (W--2808326); Thwaites C.P.1952 in part [Galle] (Pd), C.P.1952 in part [Jaffna] (Pd); Tiruvengadam & Waas 419 (N, Pd, W--2803772); C. C. Townsend 73/41 (W--2766161); Wirawan, Cooray, & Balakrishnan 899 (Ld, N, Pd, W--2656633); Worthington 5172 (K), 5325 (K), 6532 (K). CHINA: Kwangsi: A. Henry 166 (N, N, N--photo). Kwangtung: F. A. Mc Clure 378 [*Herb. Canton. Chr. Coll.* 7201] (Ph). THAILAND: K. Winit 414 in part (Bk); P. Winit 414 in part (Bk); Zimmermann 71 (S). CAMBODIA: Baker & Baker s.n. [March 9, '15] (Gg--31095). VIETNAM: Cochinchina: Pierre s.n. (S); Thorel 60 (Ca--53721), 80 (Bz--72807). MALAYA: Penang: Roxburgh s.n. [Penang] (Br). Singapore: T. Anderson 135 (Pd). GREATER SUNDA ISLANDS: Borneo: Rutten 470 (Ut--22655). HAWAIIAN ISLANDS: Oahu: Pearsall s.n. [Barber's Point, June 2, 1950] (Bi). CULTIVATED: Florida: Fennell 1003 [Pl. Introd. 97933; seed Fairchild & Dorsett 2969] (Ba). India: Collector undetermined 592 (S); Nafday 118 (Ba). Pennsylvania: Peele 1389 (Ba). Sri Lanka: Moldenke, Moldenke, & Jayasuriya 28175 (Pd, W--2764400). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Jard. Bot. Brux.* s.n. (Br); *Herb. Linnaeus* 780/2 (Ld--photo of type, Ls--type, N--photo of type). MOUNTED ILLUSTRATIONS: Amman, Comment. Acad. Sci. Imp. Petrop. 8: pl. 18. 1736 (Ld); Corner & Watanabe, Illust. Guide Trop. Pl. 760. 1969 (Ld); Crevost & Petélot, Bull. Econ. Indo-chine 37: opp. 1294. 1934 (Ld); Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 2: pl. 542. 1819 (Ld); Roxb., Pl. Coast Coromand. pl. 162. 1802 (Ba); Sastre, Wealth India 4: 159. 1956 (Ld).

GMELINA ASIATICA f. LOBATA Mold., Phytologia 32: 47. 1975.

Bibliography: J. A. Murr. in L., Syst. Veg., ed. 12, 564. 1784;

J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 1 & 3. 1810; Roxb., Fl. Ind., ed. 2, imp. 1, 3: 87--88. 1832; D. Dietr., Syn. Pl. 3: 613. 1843; Walp., Repert. Bot. Syst. 4: 97. 1845; Schau. in A. DC., Prodr. 11: 679. 1847; Miq., Fl. Ned. Ind. 2: 866. 1858; C. B. Clarke in Hook. f., Fl. Brit. India 4: 582. 1885; Brandis, Indian Trees, imp. 1, 509. 1906; Gamble in King & Gamble, Journ. Roy. Asiatic Soc. Beng. 74 (2 extra): 823. 1908; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 64. 1921; Haines, Bot. Bihar Orissa, ed. 1, 4: 720. 1922; Ridl., Fl. Malay Penins. 2: 622. 1923; P'ei, Mem. Sci. Soc. China 1 (3): 119. 1932; Dop in Lecomte, Fl. Gén. Indo-chine 4: 846. 1935; Fletcher, Kew Bull. Misc. Inf. 1938: 204. 1938; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 1, 505. 1958; Mold., Phytologia 32: 47. 1975; Anon., Biol. Abstr. 61: AC1: 619. 1976; Hocking, Excerpt. Bot. A.28: 171. 1976; Mold., Phytologia 34: 263 & 265. 1976; Mold., Phytol. Mem. 2: 268, 296, & 549. 1980; Brenan, Ind. Kew. Suppl. 16: 130. 1981; Mold., Phytologia 50: 252. 1982; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 395 & 397. 1983; Mold., Phytologia 55: 335. 1984.

This form differs from the typical form of the species in having its leaf-margins conspicuously and uniformly more or less 3--7-lobed.

The form is based on *Wirawan, Cooray, & Balakrishnan 899* from the Smithsonian Camp, Marai Villu, Wilpattu National Park, Sri Lanka, collected on June 30, 1969, and deposited in the Britton Herbarium at the New York Botanical Garden.

It seems most probable that this is only a juvenile form of the species, often also occurring on turions or watersprouts, but apparently sometimes persisting to the mature flowering and fruiting stages of growth. Hunter (1909) regarded the "most entire" leaved form (which I regard as the typical form) as *G. integrifolia* Hunter, although his description seems to at least include also typical *G. elliptica* J. E. Sm. Most of the authors listed in the bibliography of *G. asiatica* (above) refer, in some way or another, to the lobed-leaved form, sometimes with the parenthetical added statement "sterile shoots", but there are some authors [*viz.*, Blume (1826), Kurz (1877), Lam (1919), and Talbot (1976)] who omit any mention of it. In the typical form of *G. asiatica*, in my interpretation of it, the leaf-blades are either completely entire (unlobed) or only obscurely 1-lobulate.

Militating against the theory that the lobed form occurs only on juvenile or otherwise sterile shoots is the fact that the *Chin 937* collection, cited below, is in full anthesis and the *Wirawan & al. 899* type collection is in fruit.

Collectors have found this plant on limestone debris, at 50--100 m. altitude, describing it as a shrub, 2--3 m. tall, the corollas yellow (in March) and the fruit green (in June). Herbarium material has mostly been identified and distributed in herbaria as typical *G. asiatica* L.

Citations: SRI LANKA: *Wirawan, Cooray, & Balakrishnan 899* (Ld--isotype, N--type, Pd--isotype, W--isotype). MALAYA: Perak: *Chin 937* (K1--19928). Singapore: *J. Sinclair 5556* (W--2912695).

GMELINA ATTENUATA Fletcher, Kew Bull. Misc. Inf. 1938: 203--204. 1938.

Bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 202--204 & 422. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 93. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 137 & 186. 1949; Anon., Kew Bull. Gen.. Ind. 134. 1959; Mold., Résumé 178 & 456. 1959; Mold., Fifth Summ. 1: 296 (1971) and 2: 879. 1971; Mold., Phytol. Mem. 2: 286 & 549. 1980; Mold., Phytologia 55: 335. 1984.

A low shrub, to about 5 m. tall; branchlets tetragonal, variegated with brown, the young parts pubescent and with white sessile glands, later almost glabrous and much less glandulose; leaves decussate-opposite; petioles 0.5--2 cm. long, brown, canaliculate above; leaf-blades chartaceous, elliptic or subobovate, 6--10.5 cm. long, 2--5 cm. wide, apically subacuminate and slightly lobulate, marginally entire and slightly recurved, basally long-attenuate, gray-brown (in drying) and glabrous above, gray-brown (in drying) and slightly pubescent beneath, marked with sessile, round, white glands; midrib and the 3--5 pairs of secondaries inconspicuous above but prominent beneath, the secondaries parallel; tertiaries transverse, strong, numerous, parallel; inflorescence terminal, 2 cm. long, densely fulvous-tomentose; pedicels short, fulvous-puberulent; bracts at the base of the panicle pubescent, the lower ones 15--20 mm. long, the upper ones very small; calyx externally fulvous-tomentose, the tube 4 mm. long, internally glabrous, somewhat sinuate-lobulate; corolla yellow, externally lightly tomentose.

The species is based on *Kerr 6224* from an open grassy forest at Chiengma, Payap, Thailand, at 1100 m. altitude, deposited in the Kew herbarium. The author notes that the species "*G. asiaticae* Linn. foliis biformibus integris et profunde lobatis affinis, sed foliis maioribus basi attenuoribus, inflorescentiae forma differt." The species it known to me only from the original description. Fletcher (1938) differentiates it from the other Thailand species known to him as follows:

1. Inflorescence a small compact terminal panicle; calyx with 4 teeth; corolla with 4 lobes.
2. Leaves at most 5 cm. wide, strongly tapering at the base.....
G. attenuata.
- 2a. Leaves at least 5 cm. wide, hardly cuneate at the base.....
G. paniculata.
- 1a. Inflorescence a large terminal panicle or a small terminal raceme of cymes.
3. Inflorescence a large terminal panicle; calyx with 5 small teeth; corolla with 5 lobes.....*G. arborea*.
- 3a. Inflorescence a small terminal raceme of cymes; calyx with 4 small teeth; corolla with 4 lobes.
4. Bracts leafy.....*G. philippensis*.
- 4a. Bracts small, linear.
5. Leaves tomentose beneath.
6. Leaves elliptic, the mature ones slightly cuneate, faintly pubescent but more often glabrous above.*G. elliptica*.
- 6a. Leaves ovate to slightly elliptic, the mature ones deltoid at the base, tomentose above.....*G. tomentosa*.

- 5a. Leaves glabrous or occasionally faintly pubescent beneath.....*G. asiatica*.

Gmelina balansae Dop, Bull. Soc. Bot. France 61: 322--323. 1915.

Synonymy: *Gmelina lecomtei* var. *annamitica* Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 896. 1933. *Gmelina speciosa* Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 93 nom. nud. 1942. *Gmelina chinensis* L. ex Mold., Résumé Suppl. 3: 32 in syn. 1962 [not *G. chinensis* Benth., 1861].

Bibliography: Dop, Bull. Soc. Bot. France 61: 322--323. 1915; Prain, Ind. Kew. Suppl. 5, imp. 1, 115. 1921; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 896. 1933; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 93. 1942; H. N. & A. L. Mold., Pl. Life 2: 49. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 136 & 186. 1949; Mold., Résumé 176, 297, & 456. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 115. 1960; Mold., Résumé Suppl. 3: 32. 1962; Mold., Fifth Summ. 1: 301, 523, & 524 (1971) and 2: 879. 1971; Mold., Phytol. Mem. 2: 290, 293, & 549. 1980; Mold., Phytologia 55: 334. 1984.

A tree, 7--8 m. tall; young branchlets lightly yellow-tomentelous; petioles slender, 5--6 cm. long, subglabrous; leaf-blades chartaceous, ovate or elliptic to trapezoid, to 21 cm. long and 11 cm. wide, apically acute or obscurely acuminate, marginally entire or obscurely sinuate, basally cuneate, glabrous and shiny above, nigrescent in drying, lighter and at first pubescent, later glabrous beneath, glanduliferous at the base; secondaries 3 or 4 per side, oblique, prominent, straight or slightly arcuate; veinlets very slender, transverse, parallel; cymes few-flowered, arranged in corymbiform panicles, lax, 30 cm. long, lightly fulvous-tomentose, the branching di- or trichotomous; bracts ovate or elliptic, apically acute, basally attenuate; pedicels 5--6 mm. long; calyx broadly campanulate, 1 cm. long, externally glabrous, often apically with some minute black glands, the rim truncate, often with 5 very small or obsolete teeth; corolla yellowish-violet, 2.5--3 cm. long, pruinose, the tube basally cylindric, apically broadly dilated, the lobes 5, subequal, rounded, the largest (on the lower lip) 12 mm. long; stamens 4, subexserted; anthers pendulous, the thecae subparallel, basally acute; ovary apically sparsely pilose; style 14 mm. long, apically sparsely pilose; stigma bifid, the lobes equal; drupes yellow or black, oblong, 1.5 cm. long, 7 mm. wide, apically depressed; seeds 1 or 2.

The species is based on an unnumbered Harmand collection from between Mekong and Hué, Annam, Vietnam, *Spire* 233 from Phronthane, Laos, and *Balansa* 3806 from Lankok, Mt. Bavi, Tonkin, and *Bon* 5413 from somewhere in Tonkin, Vietnam, all probably deposited in the Paris herbarium. *Gmelina speciosa* is based on *Balansa* 3806 (above) collected on June 24, 1887 and deposited in the Kew herbarium.

Dop (1915) comments that "Cette espèce est voisine du *Gm. chinensis* Bentham; elle s'en distingue par la dimension des feuilles, les inflorescences et les lobes stigmatiques égaux. Elle se rapproche aussi du *Gm. lecomtei* dont elle s'éloigne par la forme des feuilles, les fleurs pédicellées et la dimension du fruit."

Dop (1933) later re-named this taxon *G. lecomtei* var. *annamitica*, citing an unnumbered Harmand collection from Hué, Annam, noting that it differed only from what he called *G. lecomtei* [now known as *G. racemosa* (Lour.) Merr.] in its leaves being elliptic or elliptic-lanceolate and the floral pedicels longer. His words are "Dans le travail que j'ai cité précédemment.....j'avais décrit a coté de *G. lecomtei* une autre espèce affine *G. Balansae*. Depuis la rédaction de cette note de nouveaux et nombreux échantillons reçus par le Muséum m'ont montré qu'il existait entre ces deux espèces tous les intermédiaires et qu'il y avait lieu de réduire la deuxième espèce au rang de variété dont la synonymie s'établira ainsi."

Collectors describe *G. balansae* as a "good-sized" forest tree, 8--10 m. tall, the corollas "yellow with purple", in flower from May to July.

Material of *G. balansae* has been misidentified and distributed in some herbaria as *G. chinensis* Benth., *G. lecomtei* Dop, and *G. racemosa* (Lour.) Merr.

Citations: LAOS: *Spire 233* (B--cotype, Ca--53722--cotype). VIETNAM: Annam: *Clemens & Clemens 3980* (Mi). Tonkin: *Balansa 937* (K), *3806* (K--cotype, Ld--photo of cotype, N--cotype, N--photo of cotype); *Petélot 1058* (Ca--223728), *1941* (Bz--21327, Ca--259681, N, Qu), *6849* (N), *8484* (N).

GMElina BRASSII Mold., *Phytologia* 6: 324--325. 1958.

Bibliography: Mold., *Phytologia* 6: 324--325. 1958; Mold., *Biol. Abstr.* 33: 1215. 1959; Mold., *Résumé* 201 & 456. 1959; Hocking, *Excerpt. Bot. A.5*: 44. 1962; Mold., *Résumé Suppl.* 813. 1964; G. Taylor, *Ind. Kew. Suppl.* 13: 61. 1966; Mold., *Fifth Summ.* 1: 336 & 338 (1971) and 2: 879. 1971; Mold., *Phytol. Mem.* 2: 327, 328, & 549. 1980; Mold., *Phytologia* 55: 336. 1984.

A tall tree, to 30 m. tall, the unbuttressed bole to 13 m. high and 35 cm in diameter at breast height; bark about 6 mm. thick, the outer bark pale- or gray-brown, with shallow or deep longitudinal fissures and dotted with coarse pustular lenticels, the inner bark orange-straw or cream-color, tinged with green on the back, with yellow and white alternating concentric layers within; sapwood 5 cm. deep, pale straw- or pink-straw color; heartwood very pale brown; branchlets obtusely tetragonal, brunnescenscent, very minutely puberulent or glabrous, with scattered, light-colored, rather prominent lenticels; nodes not annulate; principal internodes 3--4 cm. long; leaves decussate-opposite; petioles rather stout, 2--5 cm. long, very minutely and obscurely appressed-puberulent or glabrous, flattened above, brunnescenscent in drying; leaf-blades thin-coriaceous, gray-green or dull dark-green above, lighter green beneath, broadly elliptic or almost ovate, 8--25 cm. long, 4--16 cm. wide, apically very shortly acuminate with a broadly rounded acumen, or merely obtuse, marginally entire, basally broadly rounded or subcordate and there marked with 2 very prominent swellings above due to groups of close, flat glands beneath, glabrous on both surfaces; midrib flat above, prominent beneath; secondaries slender, 6 or 7 per side, ascending, slightly arcuate, anastomosing in many loops near the margins.

[to be continued]

A NEW SPECIES OF VERBESINA (SECT. VERBESINARIA) FROM DURANGO, MEXICO

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ABSTRACT: Verbesina corral-diazii, a new species from near Santiago Papatzi Durango, is described. It is closely related to V. longifolia of the sect. Verbesinaria. These are in turn related to V. scotiodonta and V. daviesiae, the entire complex being centered in northern Mexico. A key to the taxa and a distribution map is provided.

Recent collections by Dr. Richard Worthington and students in Durango Mexico have revealed an undescribed species of Verbesina belonging to the section Verbesinaria (Robinson and Greenman, 1899). In pursuit of its identification I was obliged to borrow materials, including types, of V. longifolia and V. scotiodonta from GH. I am grateful to that institution for such favors and to my colleague, M. C. Johnston, for the Latin diagnosis. Corral Diaz is a student at the University of Texas at El Paso working under the direction of Dr. Worthington.

The type material of Verbesina corral-diazii includes at least two leaf-forms: the holotype possessing very broad, nearly clasping, ovate-lanceolate leaves and an isotype with very narrow, non-clasping, linear-lanceolate leaves, except for the venation, very much like V. longifolia. The indument, venation, bicolored leaves and broad foliaceous bracts mark all of the types and serve to distinguish those from V. longifolia. Nevertheless, Verbesina corral-diazii is closely related to the widespread, more northern, V. longifolia, as well as the relatively localized V. scotiodonta. This three taxa are in turn related to the recently described V. daviesiae (Turner, 1983). All of these have similar habits, leaves and achenes. The following key and discussions will serve to distinguish among them.

1. Involucre 5-7 mm high, not subtended by foliaceous bracts; plants of Sierra Madre Oriental, Coahuila and Nuevo Leon ----- V. daviesiae
1. Involucre 8-15 mm high, subtended by conspicuous foliaceous bracts; plants of Sierra Madre Occidentale Chihuahua and Durango [2].
 2. Leaves bicolored, densely pubescent on both surfaces with appressed soft grey hairs; outer foliaceous involucre bracts mostly 5-25 mm wide ----- V. corral-diazii
 2. Leaves not bicolored, variously pubescent with erect or acicular, rough hispid, trichomes; outer foliaceous involucre bracts mostly 2-5 mm wide [3] -----
3. Leaves ovate-lanceolate, 4-6 times as long as wide, the margins closely serrate (3-6 serrations/cm); venation of blade seemingly pinnate, without a strong lateral closure ----- V. scotiodonta

3. Leaves linear-lanceolate, 7-15 times as long as wide, the margins remotely serrate (1-2 serrations /cm); venation of blade closed, with a well-developed anastomising vein system along the margin ----- V. longifolia

VERBESINA CORRAL-DIAZII, B. L. Turner, sp. nov.

V. longifolia accedens sed foliis biocoloribus, pilis mollis adpresis, phyllariis exterioribus latis foliiformibus.

Perennial herb to 1.5 m high. Stems terete, sulcate, densely pubescent with soft grey appressed hairs. Leaves ovate- to linear-lanceolate, 10-15 cm long, 0.4-3.0 cm wide, sessile or nearly so; blades bicolored, dark green above, whitish-gray beneath, pubescent on both surfaces with appressed soft hairs, more so beneath, the margins remotely denticulate (spaced 0.5-1.5 cm) to nearly entire. Heads 1-5 in a terminal capitulescence, the latter developing secondary branches bearing single heads and often over-topping the primary stem. Heads 1.3-1.5 cm high, over-topped by the conspicuous foliaceous outer phyllaries, the peduncles 3-15 cm long. Involucral bracts ovate-lanceolate to narrowly lanceolate, 2-3 seriate, the outer-most foliaceous series 1.5-4.0 cm long, 0.4-1.2 cm wide. Receptacle conical, 4-5 mm high, 4-6 mm across; chaff lanceolate, 8-12 mm long, 1.5-2.0 mm wide, appressed pubescent throughout, acute to acuminate. Ray florets 11-13, yellow, neuter; ligule 15-25 mm long, 4-6 mm wide; tube pubescent, ca. 2 mm long, often with 1.3 staminodia. Disk florets numerous; corollas yellow, appressed pubescent, tubes ca. 1 mm long; limbs ca. 5 mm long, 5-lobed the lobes acute, ca. 0.75 mm long. Anther sacs black, ca. 2 mm long, the ovate appendages yellow. Style branches slender with short, hispid, cuspidate appendages. Achene flattened, oval-elliptic, 5-7 mm long, 2.5-3.5 mm wide sparsely puberulent to glabrate, the margins with a narrow wing ca. 0.1 mm wide; pappus absent.

TYPE: MEXICO: DURANGO: Municipio Santiago Papasquiaro, 18.5 km WNW (by air) from Santiago Papasquiaro (25° 04' 45" N x 105° 35' 40" W), 2720 m, "on steep N slope just above bottom of ravine, plants occasional", 25 Aug 1983, R. Corral Diaz (650) and R. D. Worthington 11395. (holotype TEX; isotypes TEX, UMEX).

VERBESINA DAVIESIAE, B. L. Turner, Southwestern Naturalist 27: 345. 1982.

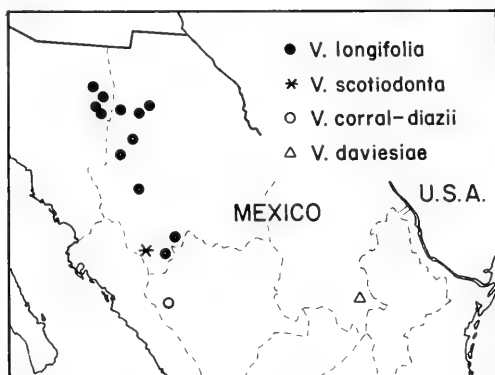
In my original description I related this taxon to Verbesina hypomalaca. Subsequent study has led me to believe that it is equally close, if not closer to V. oreophila W.&S. (not discussed further here) and the V. longifolia complex considered below. Verbesina daviesiae has the eglandular leaves and general achene structure (except for a pappus) of the latter, but differs in its more numerous, smaller heads and efoliose involucre. In short it appears to stand somewhere between V. longifolia and V. hypomalaca.

VERBESINA LONGIFOLIA (A. Gray) A. Gray, Proc. Amer. Acad. Arts 19: 12. 1883.

Actinomeris longifolia A. Gray, Pl. Wright. 2: 89. 1853.

TYPE: MEXICO: SONORA: "Mountains east of Santa Cruz", Sep 1851, Wright 1234 (holotype GH!).

This is a well-known, relatively wide spread species, as shown in the following figure:



Mexican localities for the collections mapped are based upon specimens at GH and TEX; citations are on file at the latter institution. One collection at GH (Nelson 4473, Mountains near Miquihuana, state of Tamaulipas) is surely a label error.

VERBESINA SCOTIODONTA, Blake, Contr. Gray Herb. 54: 16. 1918.

Gymnoloma serrata Rob. & Greenm., Proc. Boston Soc. Nat. Hist. 29: 99. 1899. Not G. serrata Cav. TYPE: MEXICO: CHIHUAHUA: Mt. Mohinora, 1 Sep 1898, Nelson 4891 (lectotype here selected, GH!; isolectotypes GH!, US).

This taxon is exceedingly close to V. longifolia and is distinguished primarily by leaf-shape and serrations along its margins. As noted by Blake, it is named for "the dark glandular teeth of the leaves" which are closely spaced upon relatively broad blades. Considering the leaf variation found in only a few plants from the type locality of V. corral-diazii (noted above) it is not unlikely that V. scotiodonta will be reduced to varietal status or perhaps forma. However, a single recent collection from the vicinity of the type locality (north-facing conifer slope, Sierra Mohinora, 7500 ft, 14-15 Oct 1959, Correll & Gentry 23131, LL) displays exceptionally broad, pinnately veined leaves and a closely-set dentation suggesting that the variation concerned is, indeed, regionally contained.

Literature Cited

- Robinson, B. L. and J. M. Greenman. 1899. Verbesina. Proc. Amer. Acad. Arts 39: 534-566.
- Turner, B. L. 1982. New taxa in Verbesina (Sect. Verbesinaria) from north-central Mexico. Southwestern Naturalist 27: 345-346.

BOOK REVIEWS

Alma L. Moldenke

"ATOM, MAN, AND THE UNIVERSE -- The Long Chain of Complications"
by Hannes Alfvén, translated from "Atomen människan universum"
by John M. Hoberman, 110 pp. W. H. Freeman & Company, San Francisco, California 94104. 1969. \$11.95.

The author and his translator have presented lucidly and succinctly an important alignment of facts and ideas making it fortunate for readers that this book is still readily available. "The goal of natural science is first and foremost to satisfy human curiosity by finding out how the world around us actually looks and bringing order into our chaos of experiences and observations." Later practical applications follow consequentially. Alfvén follows the "long chain of complications" from elementary particles (or wave motions) to electrons to protons to neutrons to atomic nuclei to atoms to molecules to crystals to cells to plants, other animals and man with sense organs akin to physical instruments and with nervous systems functioning on electric impulse techniques leading to TV and computers. He explains a rational God and soul concept. This book makes easy but seriously worthwhile reading.

"ENCYCLOPEDIA OF ANTIQUE SCIENTIFIC INSTRUMENTS" by John Fitz Maurice Mills, 272 pp., 16 color pl., 57 b/w photo., 18 draw. & 3 tab. Facts on File Publications, New York, N. Y. 10016. 1984. \$35.00.

This British author's field is primarily antiques and art.. He describes the early instruments primarily of astronomy and navigation concisely along with the contributions of the mechanically oriented early savants. Of course, many of these inventions helped the progress of the natural sciences by making possible the sea expeditions to new areas with more safety and therefore the concomitant discovery of new biota and the learning of even more details about those already known, as, for instance, with van Leeuwenhock's and Hook's microscopes, Celsius' thermometers and Libby's radio-carbon dating. "Instruments Throughout the World" lists several museums where these instruments can be viewed; many are very beautifully decorated. The text is very attractively presented.

"HOUSTON GARDEN BOOK - A Complete Guide to Gardening in Houston and the Gulf Coast" by John Kriegel and the Editors of Houston Home & Garden Magazine, 400 pp., 284 color photo., 88 b/w photo., 263 fig. draw. & 66 tab. Metro Home & Garden Magazines, P. O. Box 25386, Houston, Texas 77265. 1983.

This is a copiously and beautifully illustrated, well organized, helpful guide to the growing of all kinds of plants in all kinds of gardens in this humid, subtropical area of the United States which is subject also to severe and freezing storms. For as fine a production as this, it is a pity that proof-reading, at least, did not correct (1) the spelling of the grape genus *Vitis* and a few other words, (2) the definition of ovule as "vase-shaped portion of the pistil that contains the ovary" and (3) the misleading statement that "pollen arrives on the stigma and is carried down the pollen tube to the ovary. When the ovary receives the pollen, the flower produces a fruit."

"FOREST TREES OF THE UNITED STATES AND CANADA and How to Identify Them" by Elbert L. Little, Jr., i & 71 pp., 204 b/w draw. of lvs. & frs. and 204 geog. distrib. maps. Dover Publications, New York, N. Y. 10014. 1980. \$2.00 paperbound.

This is an unabridged and unaltered replication of the Forest Service Handbook No. 519, entitled "Important Forest Trees of the United States", originally published in 1978. The book is arranged very efficiently for the naturalist, the interested traveler, the forestry worker and the beginning student. For 120 eastern, 60 western and Alaskan, and 22 tropical (from Puerto Rico, the Virgin Islands, and Hawaii) species of trees there are provided simple working keys, clear drawings, filled-in maps, brief descriptions, main economic uses and state tree listings, all of which make this book highly useful. The author has been and still is the country's leading dendrologist. It is worth noting that the National Audubon Society now lists for sale all the nature-related books from the Dover republication series.

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